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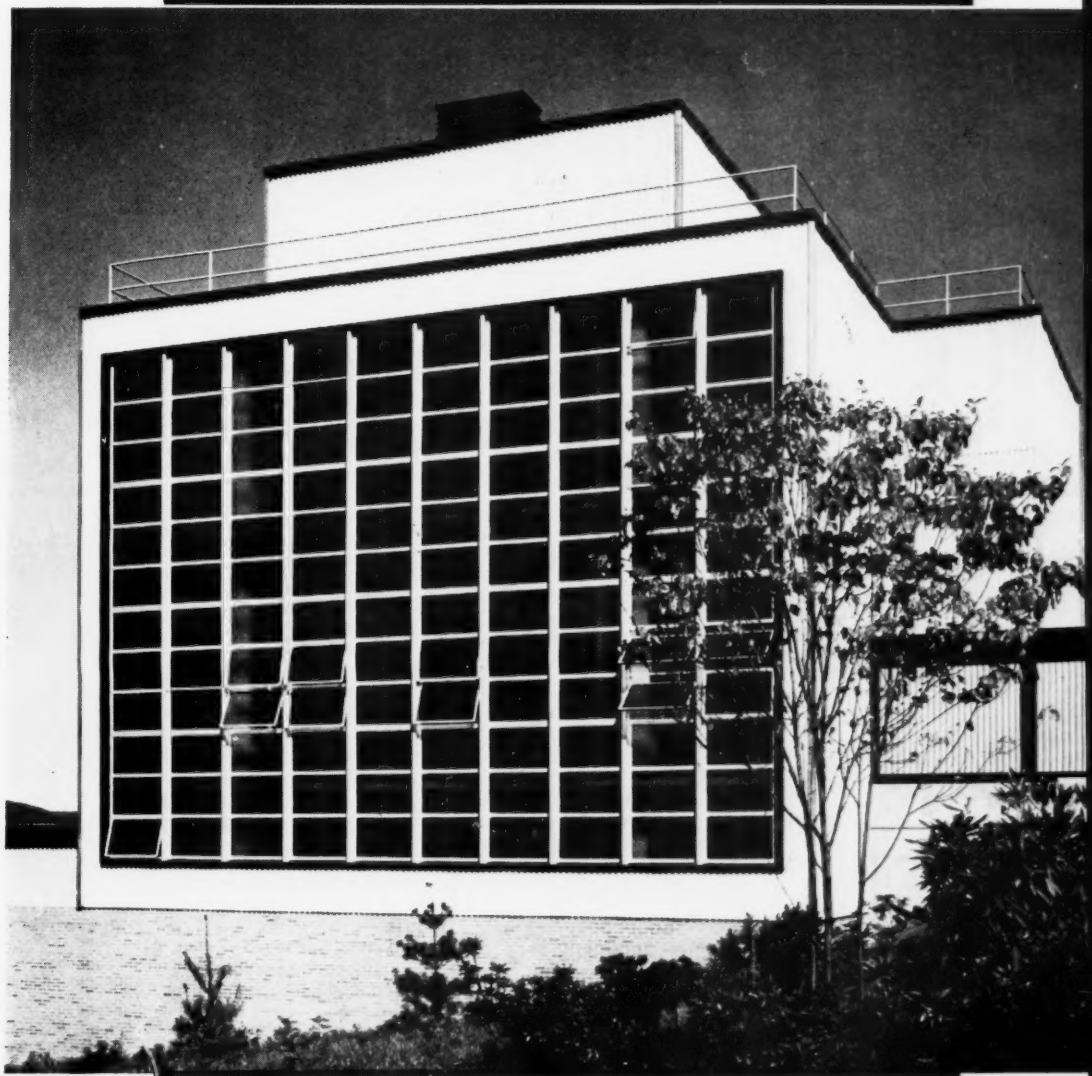

Chemical Engineering Building, One of Three, at New Research Center of United States Rubber Co., Wayne Township, New Jersey (See page 102)

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RADIATION EFFECTS IN VULCANIZATES

By Johnson, Adams, Barton, page 73

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RUBBER WORLD

OCTOBER, 1957

VOLUME 137, NUMBER 1

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A CONSTANT TORQUE ABRASION MACHINE WITH A PERMANENT ABRASIVE SURFACE ..... Ira Williams 78

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ELECTRONICALLY SORTED PUNCH CARDS FOR POLYMER COMPOUNDING DATA ..... Robert F. Neu 84

A compact, efficient, punched card technical data filing and sorting system employing an electronic statistical machine, has been found extremely useful in compound research work.

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The 1957 Charles Goodyear Medal Address, the talk on Rubber Manufacturers Association activities, and election of officers and directors are included in this report.

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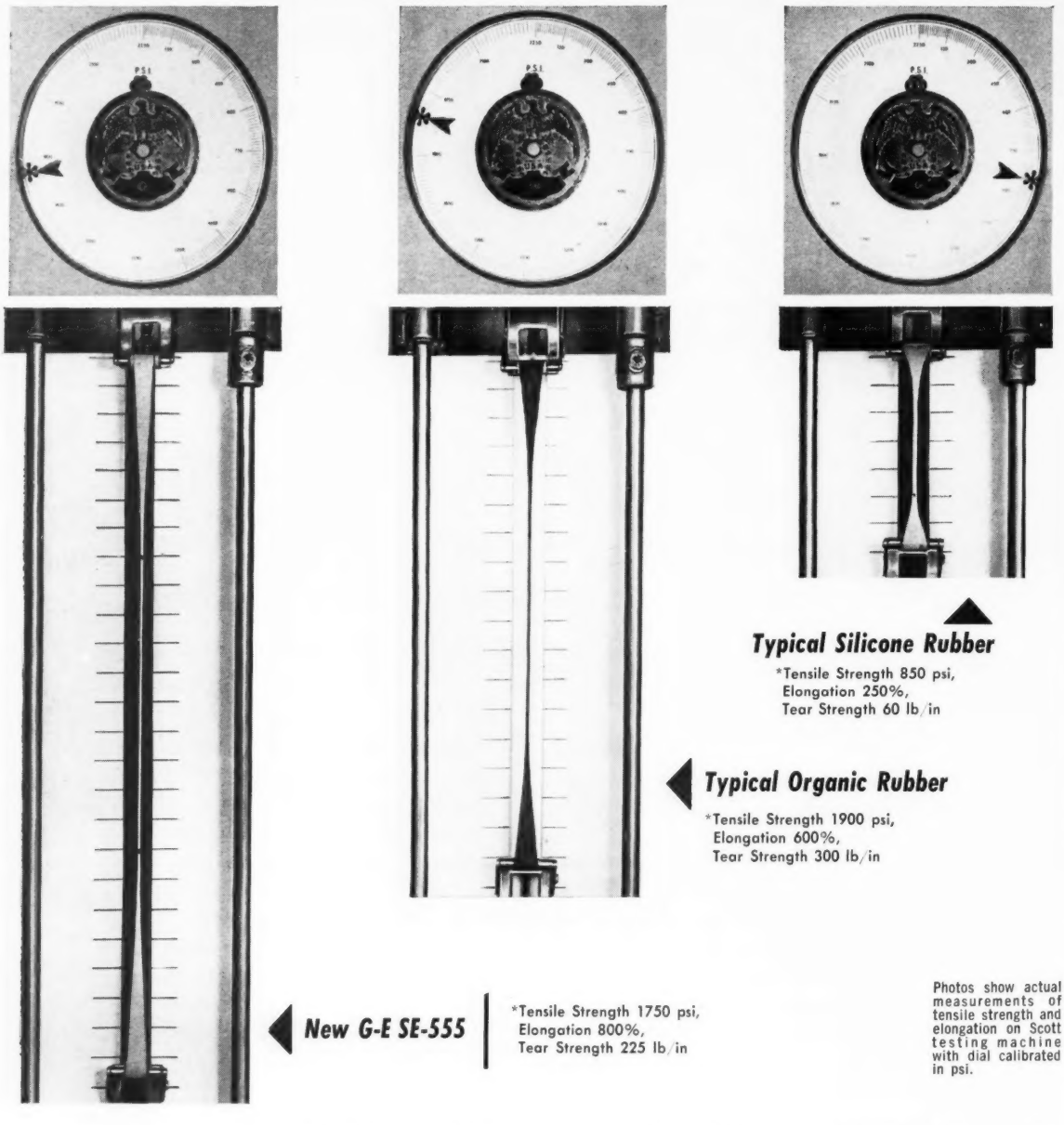

Typical Silicone Rubber

*Tensile Strength 850 psi,
Elongation 250%,
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Typical Organic Rubber

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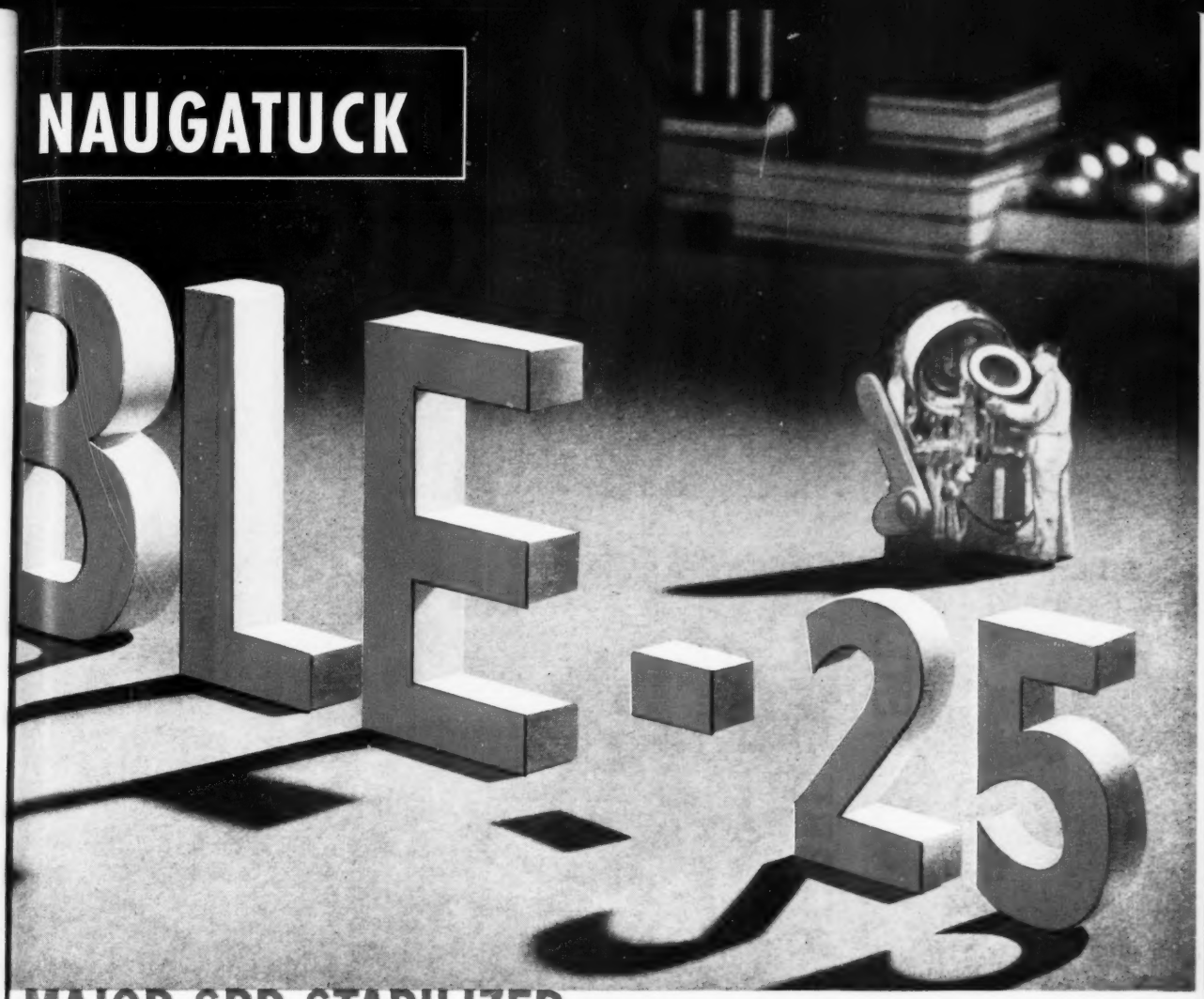

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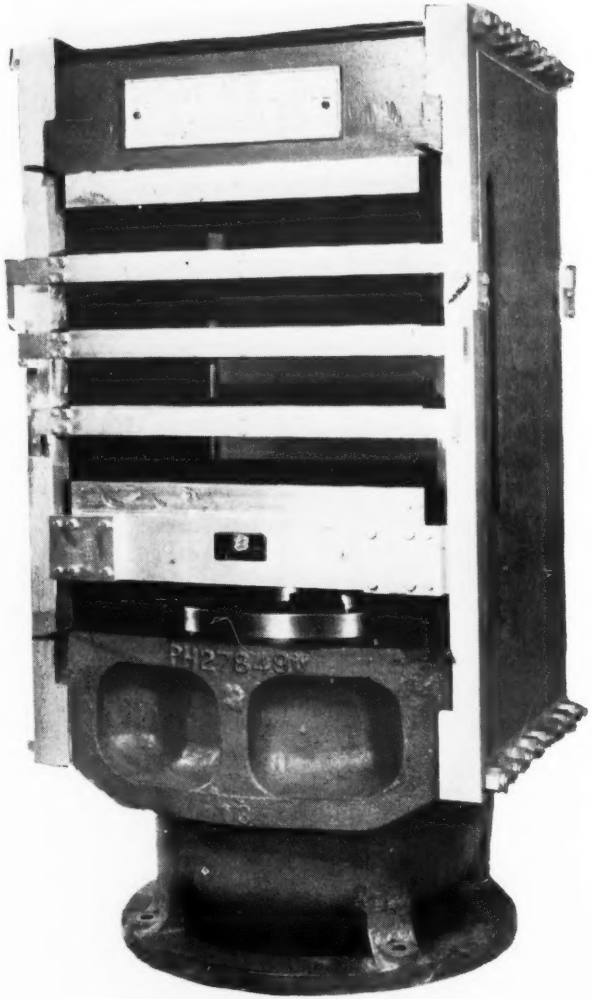

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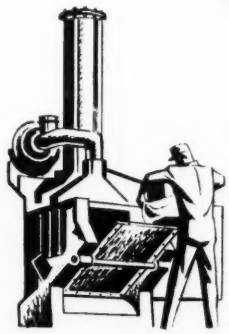

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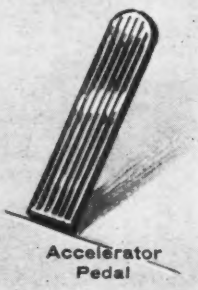
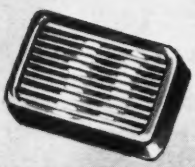


Accelerator Pedal



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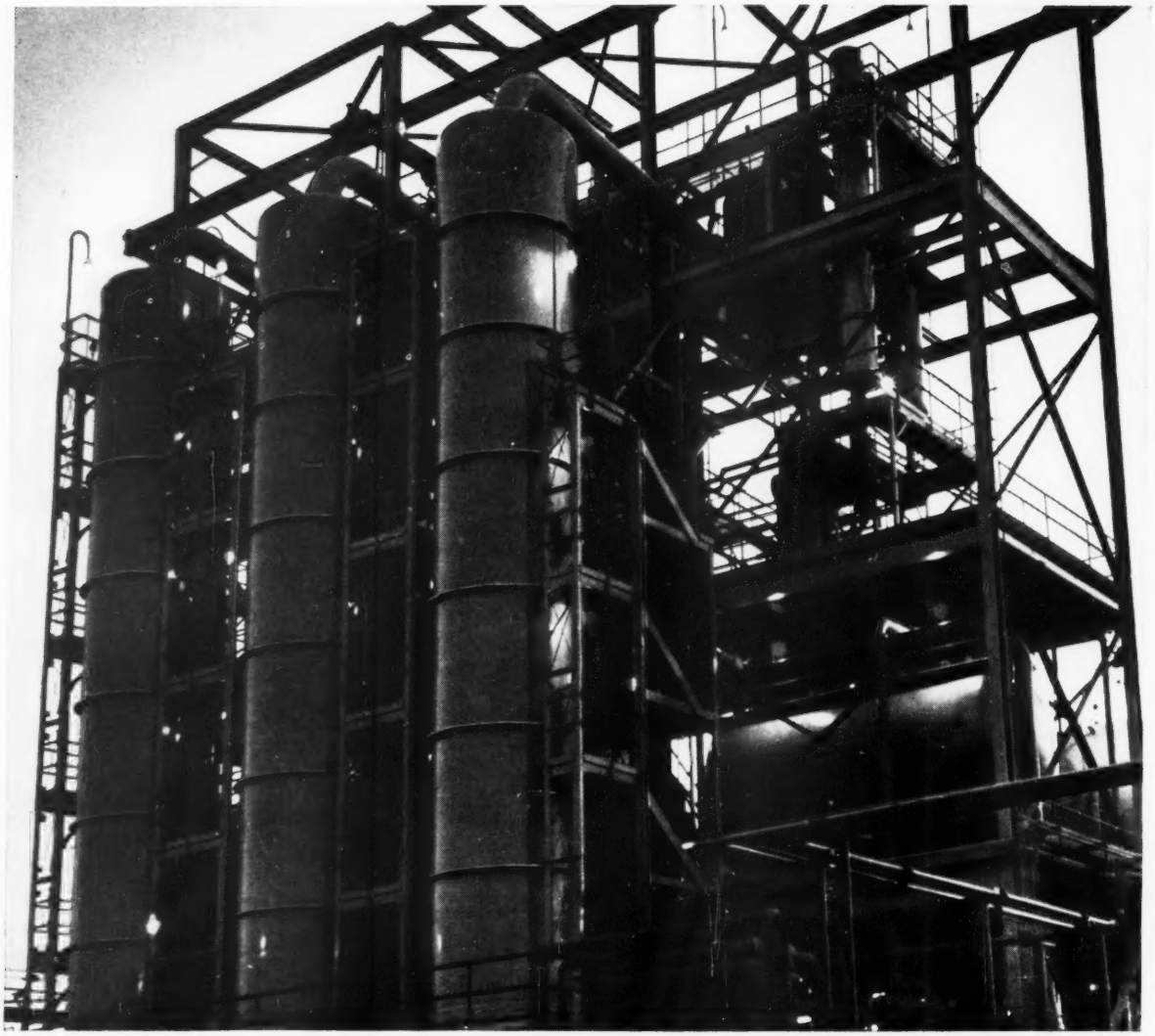

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What styrene resin for reinforcing synthetic rubber?

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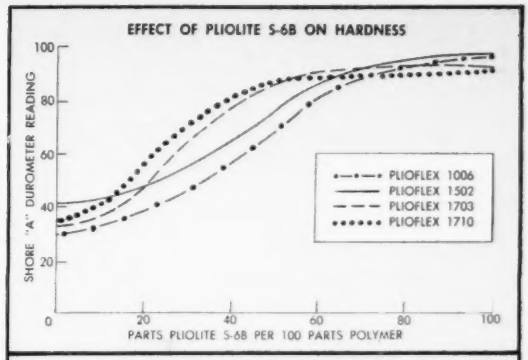

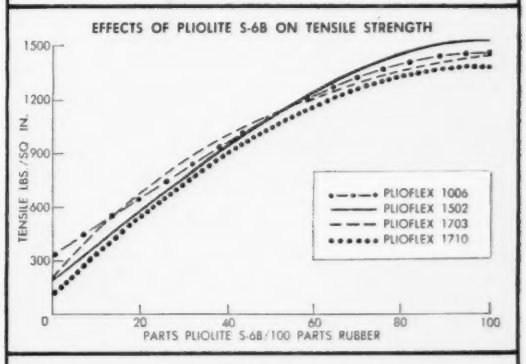

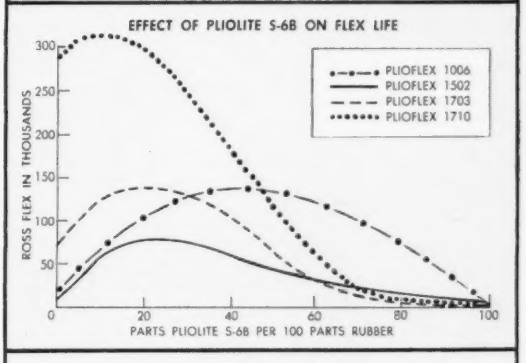

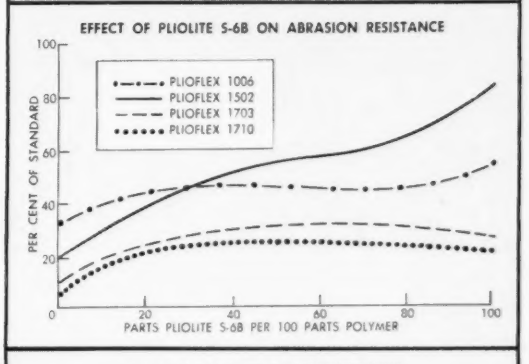

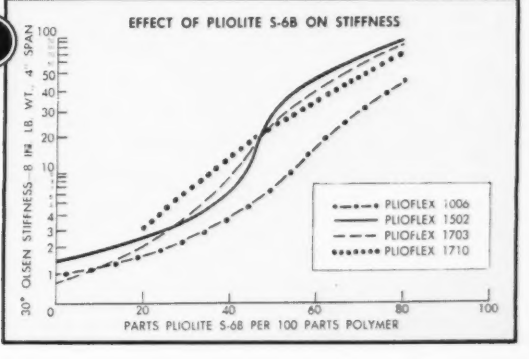
EFFECT OF PLIOLITE S-6B ON STIFFNESS
30° OLSEN STIFFNESS—8 IN. LB. WT., 4" SPAN
PARTS PLIOLITE S-6B PER 100 PARTS POLYMER
PLIOFLEX 1006
PLIOFLEX 1502
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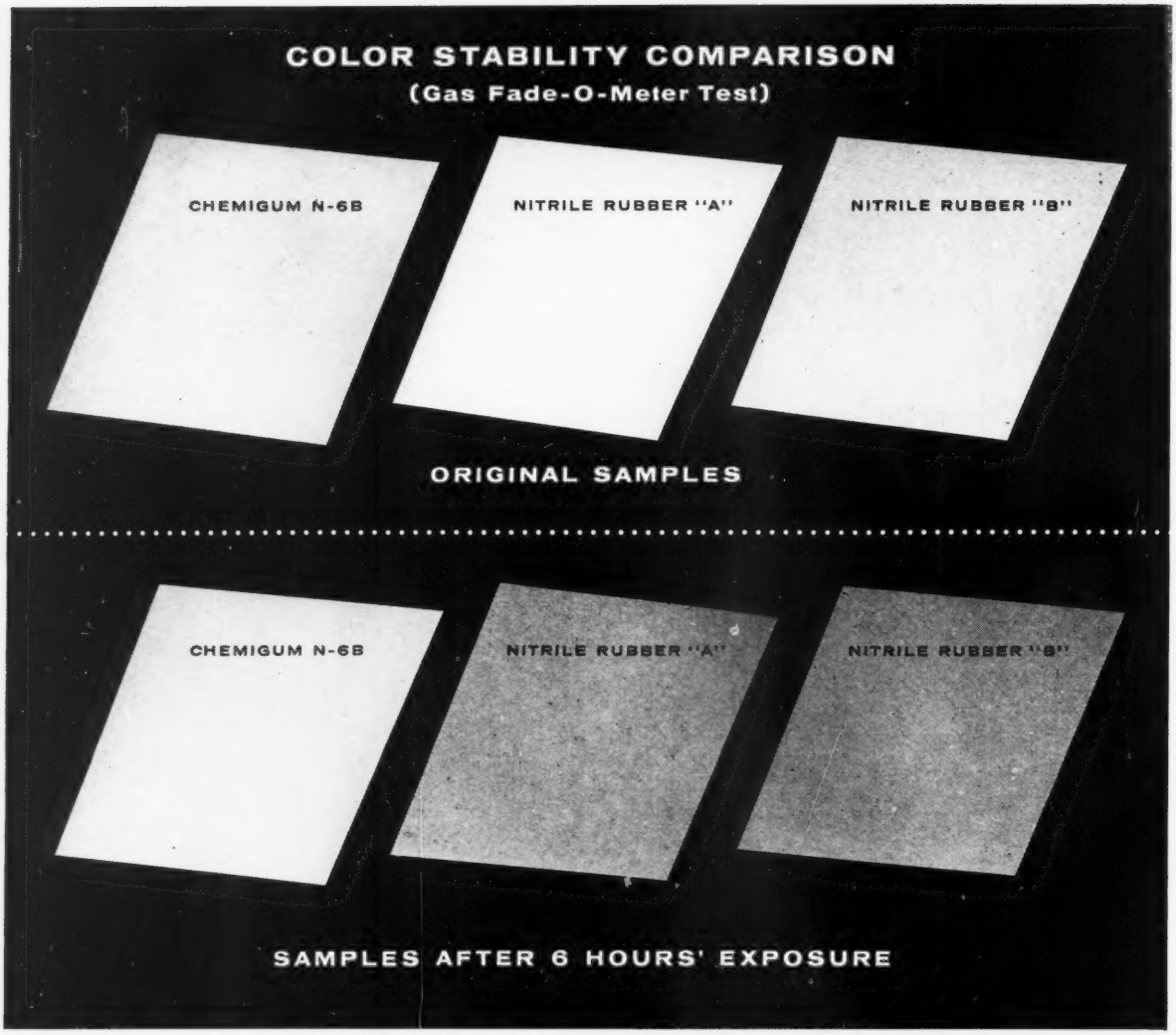
PLIOFLEX 1710



An invitation to leave the dark ages

One of the problems encountered in the manufacture of vinyl flooring is to find a permanent plasticizer that won't darken with age. Many nitrile rubbers fill the bill on permanence and compatibility with vinyls, but leave much to be desired on resisting color change.

Pictured above is a direct comparison between CHEMIGUM N-6B and two comparable nitrile rubbers in a basic, white flooring stock. Note how much more faithfully the sample containing CHEMIGUM N-6B has retained its original color, after six hours' exposure in the Gas Fade-O-Meter. And further exposure serves only to underscore the difference.

If things look dark for you in flooring, or in any use of nitrile rubber where color is critical, why not look into CHEMIGUM N-6B? Full details, including the latest *Tech Book Bulletins*, are yours by writing to Goodyear, Chemical Division, Dept. J-9418, Akron 16, Ohio. Do it *now*.

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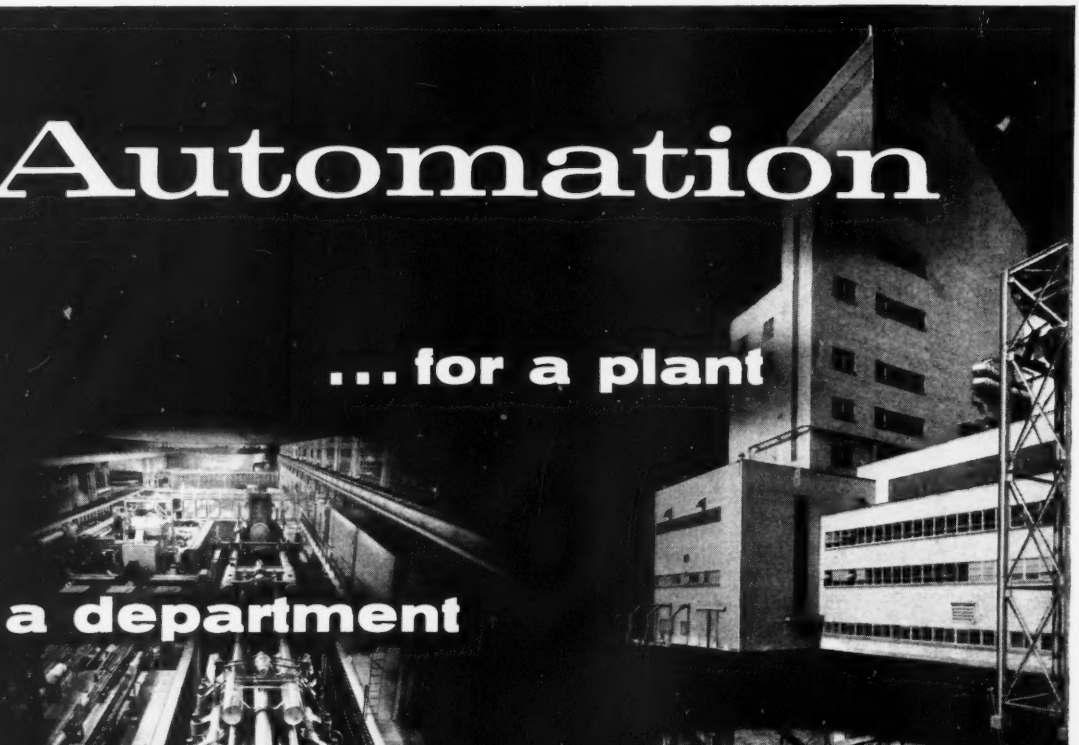

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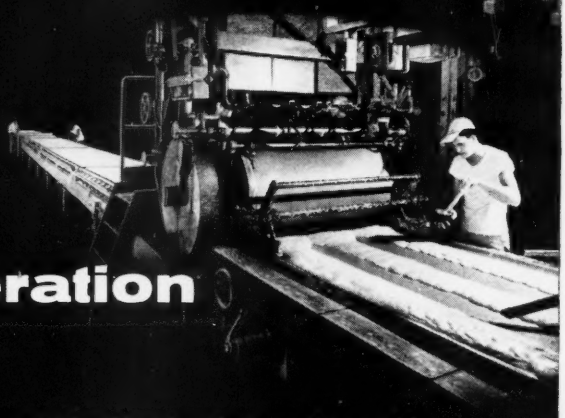

an operation

Frequently, the design of a single machine, or piece of equipment will do the job.

Whether a business is big or small, the correct application of automated equipment will increase output . . . improve product quality . . . and lower unit costs. And it can be done on a practical, cost-recovery basis! Determining whether you need automation or mechanization, *and how much or how little*, is a job that requires seasoned professional engineering experience with its attendant insights into production problems common to many industries.

Tailoring automation to meet your needs, through the design and development of automated production equipment, is among the major services offered by Giffels & Vallet. It is a service which can establish a new standard of production efficiency in your plant.

Giffels & Vallet services are discussed in a special Planning Brochure. A copy will be mailed on request.

INDUSTRIAL ENGINEERING DIVISION

Giffels & Vallet inc.

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Engineers Serving Industry for Over Thirty Years

Plant Layout • Process Development • Automation Engineering • Materials Handling • Machine Design • Building Design

Oct

In these five Standard Units are all the necessary components to control effectively the degradation mechanisms that take place in polyvinyl chloride resins on aging, during heat processing or on exposure to sunlight. They are widely used alone and in combinations for specific effects in clear and opaque stocks. Their advantages have been proven over other tested materials, such as those based on tin (which frequently decolorizes effects of degradation without correcting them) or on lead (which frequently contributes to oxidation and breakdown on aging). We also supply combinations of components selected from these five Standard Units, to correct special conditions encountered in each Vinyl Processing Industry.

Write for information about stabilizers designed for versatile and inexpensive use in formulations employed in your particular vinyl processing industry.

Is it for—

Quality Vinyl Flooring?
Non-Plating Calendered Stocks?
Maximum Clear Sheets?
Non-Sulfur Staining Films?
Low Cost Clear & Opaque Hose?
Top Physical Properties in Rigids?
Air-Releasing Plastisols?
Controlled Slush Molding?

This Stabilizer System is for

CLEAR SHEETS
Cd 2-V-4
Org 8-V-1

The HARSHAW CHEMICAL Co.

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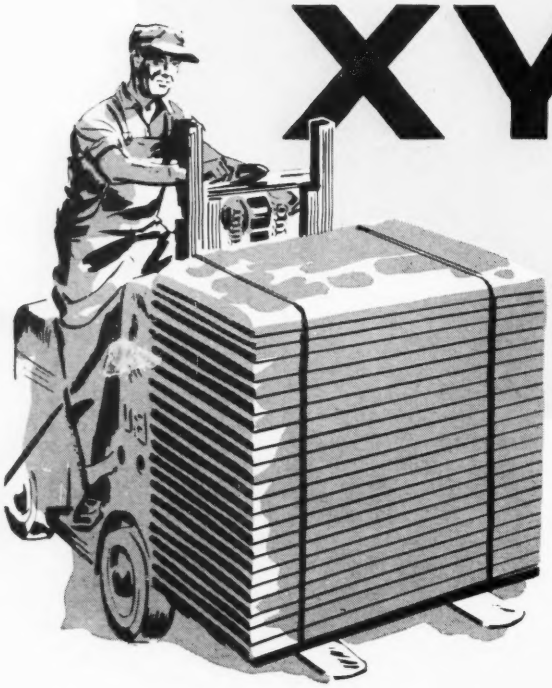
When you think of Reclaim . . .
Think of—

XYLOS



The World's Largest Reclaimer

How Xylos Reclaims Save you money...

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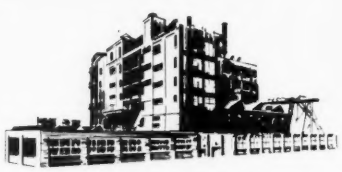
- ★ Shorter Mixing Time
- ★ Uniformity of Quality
- ★ Better Dispersion
- ★ Cooler Mixing—Less Scorch
- ★ Faster Extrusion

Wherever you're located XYLOS can serve you best— 3 factories assure you Quicker Delivery . . .



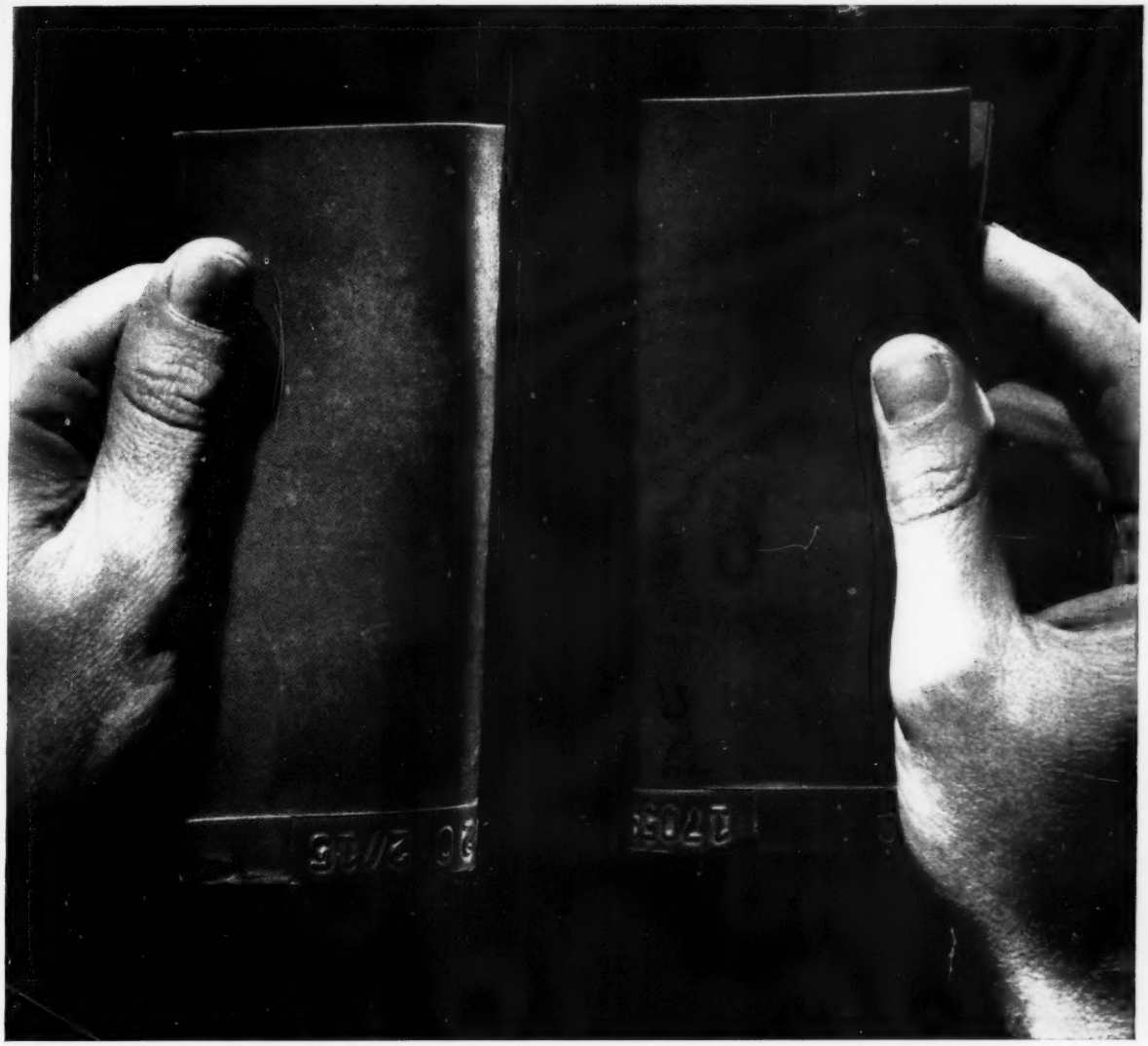
Akron, Ohio

Memphis, Tenn.

Los Angeles, Cal.

For further information or assistance with your compounding problems, write

XYLOS RUBBER COMPANY
AKRON, OHIO
A Division of The Firestone Tire & Rubber Co.



Cured sample at left, above, shows unattractive sulfur bloom. Sample at right, identical in all compounding respects but one described below, keeps bright, vibrant appearance.

BLOOMING BLOCKED, BUTYL BOOMS

HI-SIL® formulations save colored butyl articles from disfiguring bloom, up-grade physical properties

Industrial designers like butyl rubber. They've learned that butyl combines desirable characteristics (resilience, weathering and aging resistance, low costs) found only individually in thermoplastics, natural rubber, and GR-S.

Colored and white butyl goods particularly attract designers. Columbia-Southern's HI-SIL reinforcing pigment solved *one* problem several years ago: the production of non-black butyl boasting excellent physical properties. Now new HI-SIL formulations solve the *remaining* difficulty: elimination of sulfur bloom and its gray, dusty look.

Essentially, blooming is prevented by using a combination of elemental sulfur and an organic sulfide. The sulfide provides, in non-blooming form, the additional sulfur required for thorough curing. This development, the result of original research in the Columbia-Southern Rubber Laboratories, is covered in our July 1954 Bulletin on colored butyl compounding.

HI-SIL — sulfur-organic sulfide recipes available from Columbia-Southern offer economical manufacture of durable, brightly colored butyl channel strip, grommets, pedal pads, dampers, vibration mounts and other molded and extruded parts. This loading technique is also applicable to black stocks. For more specific information, write Room 1929W in Pittsburgh, or contact any of the fourteen Columbia-Southern District Sales Offices.

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provide greater dilutability

aid film formation

improve spreading characteristics

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These water-soluble polyacrylates are available in the correct pH, solids content, and viscosity for your requirements.

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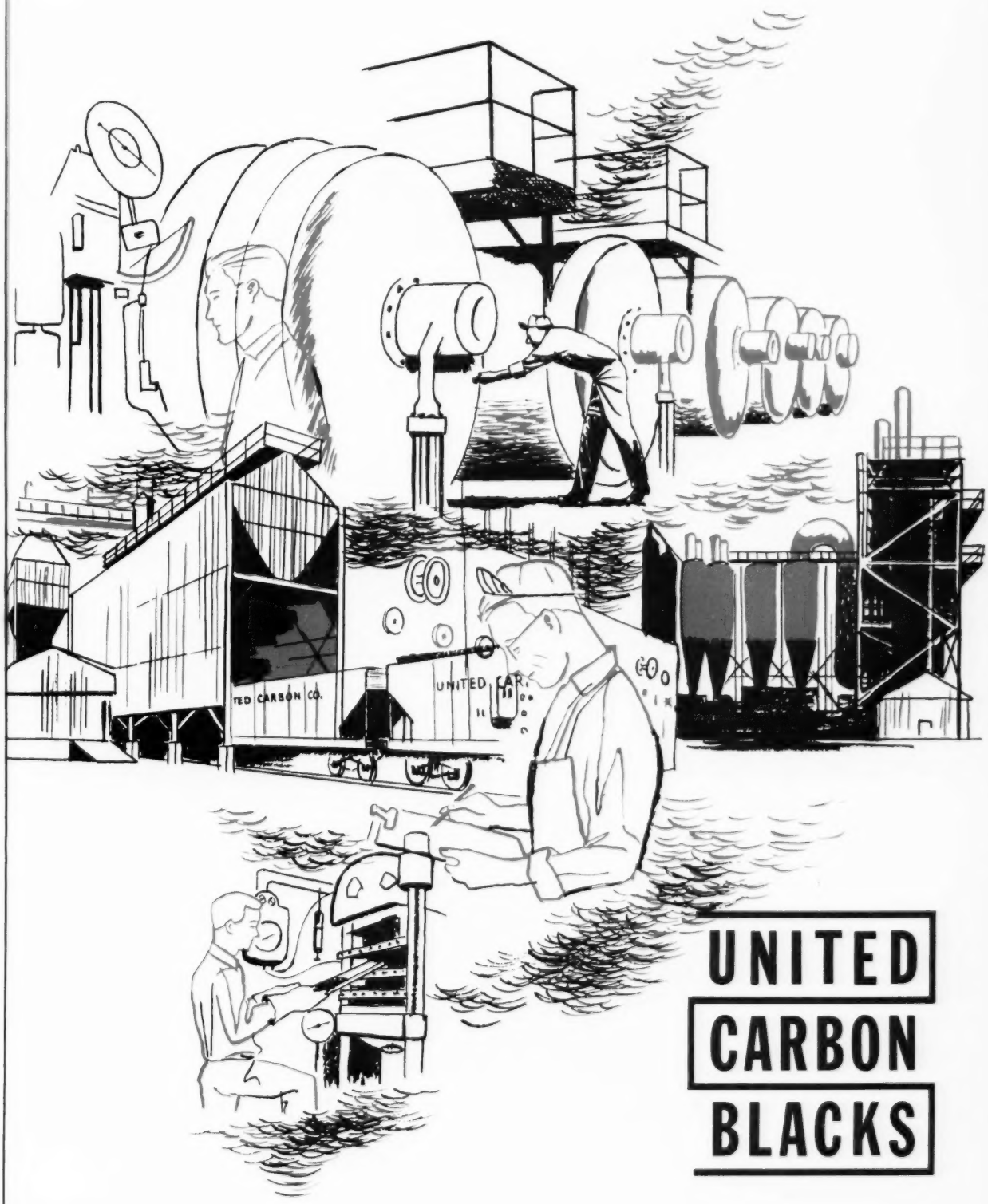
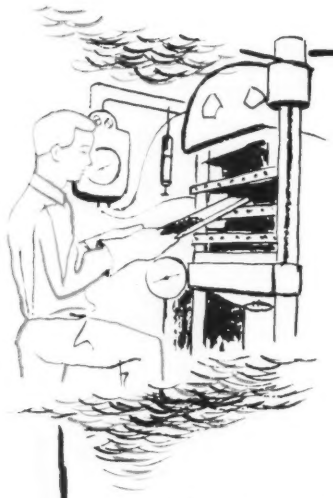


UNITED CARBON BLACKS



KOSMOS 35 is a General Purpose Furnace (GPF) black with well-balanced processing and reinforcement properties.

KOSMOS 35 basically comprises essential features of fast extrusion furnace and high modulus semi-reinforcing blacks. It therefore reflects economy.

KOSMOS 35 appeals to discerning compounders, for it is adaptable to many stocks requiring more than one type of black for completion.

KOSMOS 35 does the job. Its high resilience, low heat build-up, and good flex resistance serve it well in tire body stocks. Of course, it has ever so many applications in a variety of mechanical rubber goods.

Standardize on **KOSMOS 35** for all-around good rubber properties and where wear is not a criterion. **KOSMOS 35** and other **UNITED** blacks are here to help you. . . . Profit by them.

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If you are not already using our water-white, uniform, exceptionally-pure aniline, we will be pleased to furnish samples, specification and price quotation.

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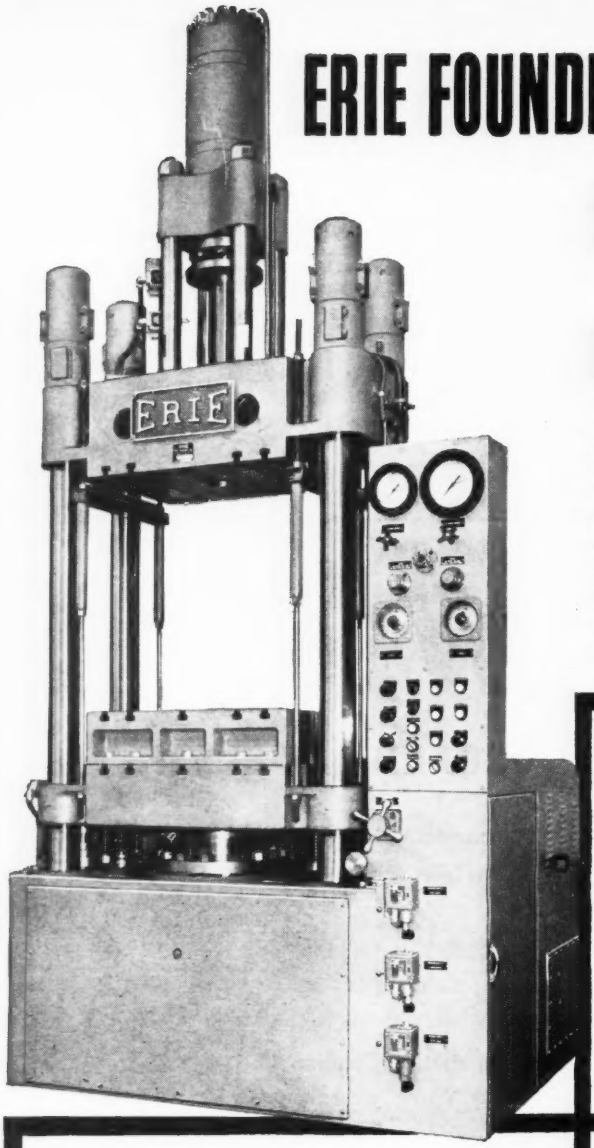
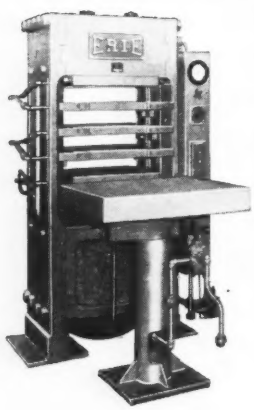
ERIE FOUNDRY HYDRAULIC PRESSES for MOLDING RUBBER and PLASTICS



Hydraulic presses, designed and built by Erie Foundry Company are precision presses in every sense of the word . . . tonnages are accurate and precisely applied, platen temperatures are closely controlled, and molding cycles perform at split second timing. Erie Foundry Hydraulic Presses are flexible too . . . readily adaptable to almost any molding job. Write for complete information on these presses or on the complete line of Erie Foundry rubber and plastic hydraulic presses.

TRANSFER and COMPRESSION MOLDING PRESS

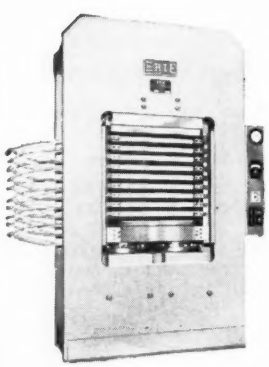
A flexible press for both compression and transfer molding is this 200 ton self-contained semi-automatic Erie press. This machine is equipped with a 55 ton transfer cylinder which can be timed separately from the main ram, as well as knock out cylinders on the bolster and a mechanical knock out for the top mold. Automatic cycling can be easily arranged to mold almost any product.



STRAIN PLATE PRESS for MINIMUM DEFLECTION

The platens stay parallel within .002" on this 314 ton press built of low-stress construction throughout. This press can be converted to transfer molding if desired.

We built the hydraulic lift table, too.



HOT PLATEN PRESS OF ECONOMICAL DESIGN

This 800 ton press is compact and rigid. Accurate platen alignment is maintained with minimum deflection over entire range of platen temperatures.

Hydraulic Press Division

ERIE FOUNDRY CO. ERIE 7, PA.

SINCE 1895 THE GREATEST NAME IN HYDRAULIC PRESSES

ERIE

Naugatuck PYRATEX

gives super adhesion to carcass cords!

Planes, off-the-road trucks and earth-moving equipment put terrific strains on tire carcasses... strains that demand *super adhesion* in the rubber that bonds the carcass cords. And that's the kind of adhesion PYRATEX* gives to rayon, nylon or cotton cords!

This vinyl pyridine copolymer latex, compounded with resorcinal-formaldehyde, can be used full strength as a cord or fabric dip to produce *maximum* rubber-to-fiber adhesion. For lower-cost formulations the Pyratex-resorcinal-formaldehyde compound may be added to a butadiene-styrene latex in the proportion of 25 to 75 on the basis of solids content. For use as a cord dip the solution is further diluted to a solids concentration of between 10% and 20%.

Even this economical blend of PYRATEX gives RS-type latex almost *two-thirds more adhesion* to rayon and nylon fibers... greatly improves fatigue resistance.

Take advantage of the *super adhesion* of PYRATEX to give greater carcass strength and longer life to *your* tires, hose, belting and other fabric-reinforced rubber goods! Order a trial drum or truckload today... or contact your nearest Naugatuck branch office for further data.

*Naugatuck's trade name for its vinyl pyridine latex.

Naugatuck Chemical

Division of United States Rubber Company
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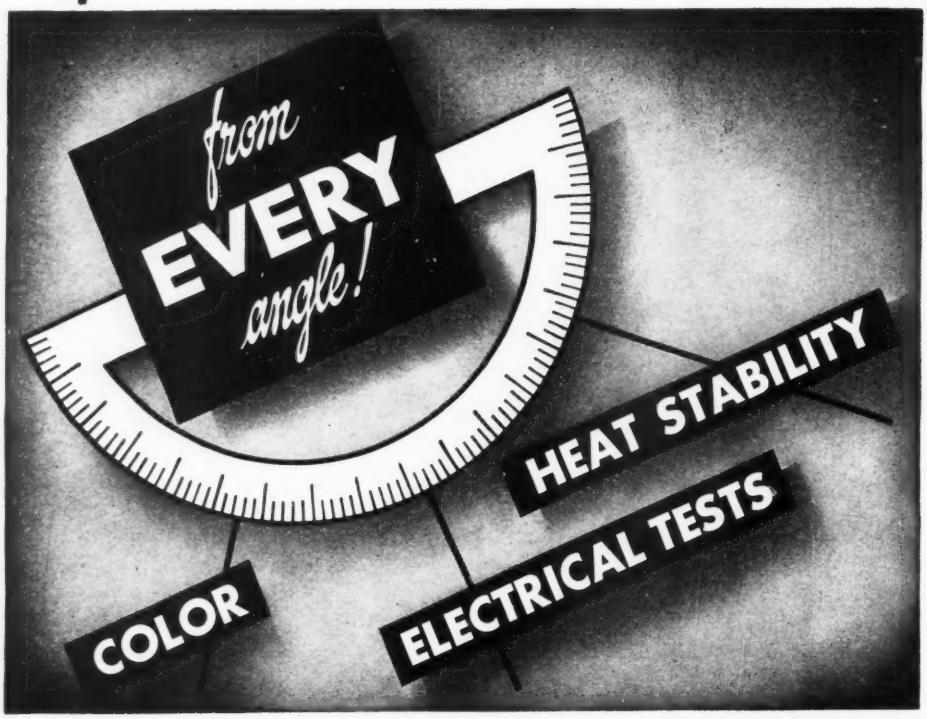
US RUBBER



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VINYLS AND SYNTHETIC RUBBER

Sample and technical data sent promptly on request

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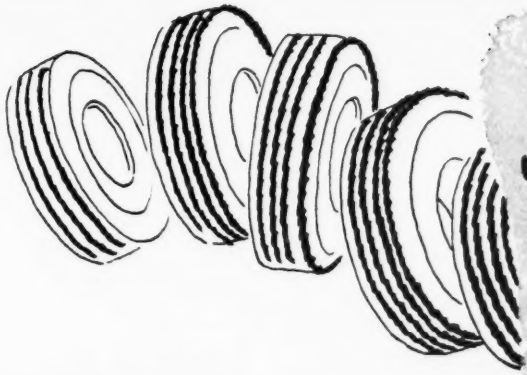

"when I said, 'no ozone cracking ever' ..... that clinched the sale!"

UOP 88 and 288

antiozonants help salesmen make sales

When your salesmen go out to sell to your dealers . . . when your dealers' salesmen sell to consumers . . . UOP 88 and 288 antiozonants give your tires these plus factors that help them rack up more sales:

- Positive, built-in protection against ozone cracking, weather checking. Not just coated protective, UOP 88 and 288 form an impregnable *chemical barrier* against ozone attack . . .
- Pre-mold addition of UOP antiozonants 88 and 288 improve the rubber in the tire . . .
- Tire life is extended. No matter what the time lag between manufacture and consumer use of your product, it will be in prime condition, will give longer, better consumer satisfaction . . .
- No special handling of tires is needed. UOP 88 and 288 antiozonants are a part of the tire . . . won't chip off, crack, or peel—ever. The protection outlasts the tread.

The reputation of your company rides on every tire you make. UOP 88 and 288 help you protect that reputation, give your salesmen "an edge" when it comes to writing the order.

UOP 88® and 288
TRADEMARK
RUBBER ANTIOZONANTS

UOP®

UNIVERSAL OIL PRODUCTS COMPANY
30 ALGONQUIN ROAD
DES PLAINES, ILLINOIS, U. S. A.

COMING AND GOING

ST. JOSEPH LEAD COMPANY
ST. JOE ZINC OXIDE
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ZINC OXIDE SERVES THE RUBBER INDUSTRY WELL

On the 'coming' side, zinc oxide serves the rubber industry because rayon serves it. Rayon is a large consumer of zinc oxide. Rayon finds in the rubber industry its largest single outlet, particularly in the manufacture of passenger car tires. The records show that 99.2% of 1957 passenger car models have rayon cord tires as original equipment.

On the 'going' side, rubber itself is the largest consumer of zinc oxide for processing. As fabricated rubber products go out in the world of commerce zinc oxide can claim more than a modest share in their production. It is essential for the processing of rubber.

St. Joe produces more than thirty different grades of zinc oxide, each have special characteristics and properties. Our technical staff with its well-equipped laboratory is at your service to assist in any application problem.

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Rubber reclaimed by the alkali, pan-process or neutral digester process swells more readily, has lower tailings, has desirable plasticity, and is easier to incorporate into synthetic or natural rubber when you use Velsicol reclaiming oils custom-made for your operating conditions. Let a Velsicol representative study your needs, and make recommendations. No cost or obligation.

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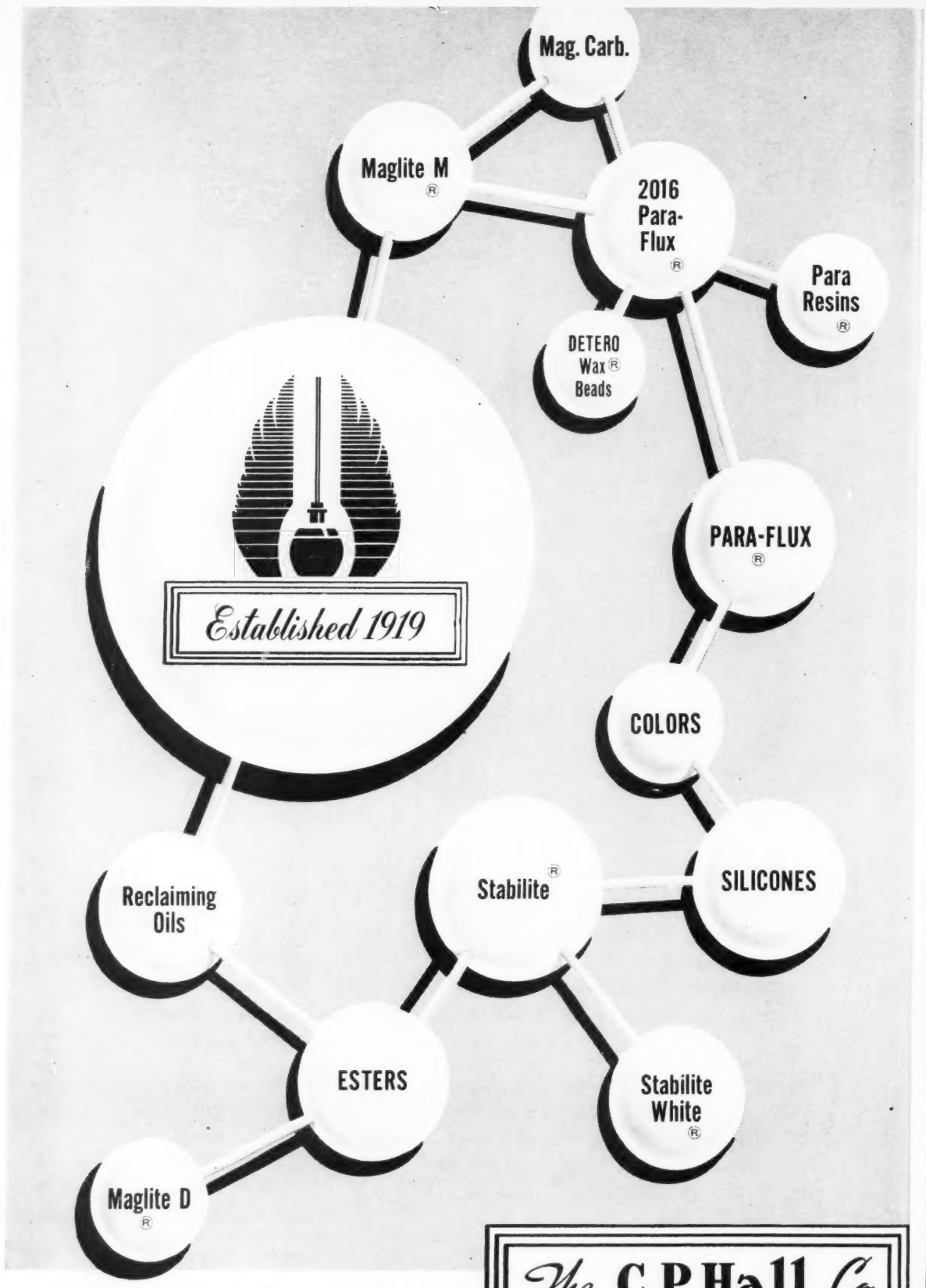

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means good service in cold rubber...

...and good service means DEPENDABLE DELIVERY.
They go hand in hand.

pioneering · uniformity · well-packaged · high quality

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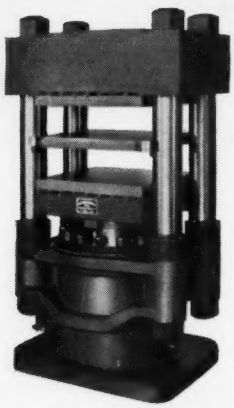
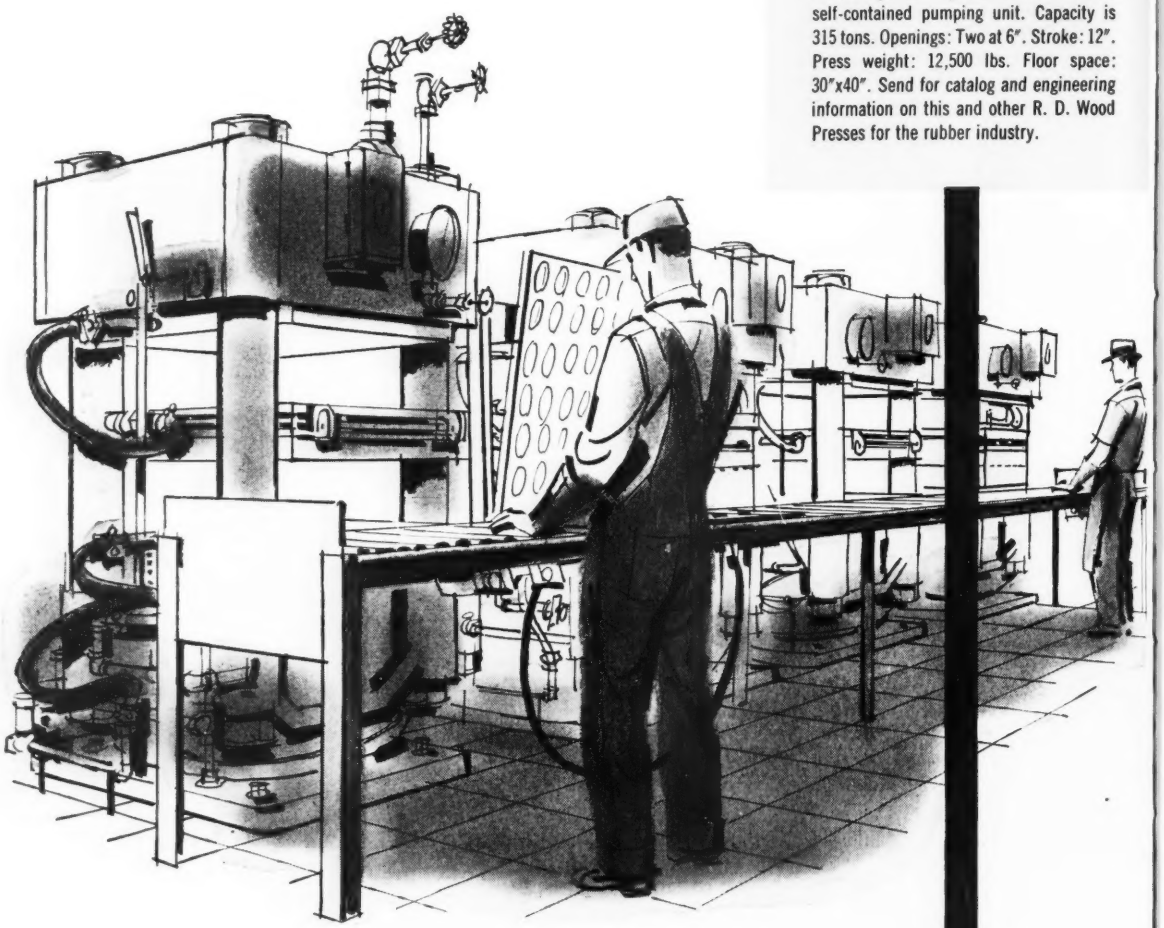
Engineered for Performance

Put a Wood Press to work and get the money-saving advantages of smooth, dependable performance . . . long operation with low maintenance.

Reason: every Wood Press is the product of sound design, carefully selected materials, conscientious craftsmanship. This is why Wood Presses are known throughout industry for their trouble-free operation and fast, economical production. R. D. Wood has many standard press designs for such jobs as molding, curing, laminating, polishing and processing—and engineers others for special work. Write for our catalog and engineering information. No obligation, of course.



R. D. Wood High-accuracy 24″x24″, 2-opening Press for molding rubber products. Can be furnished for operation from a central hydraulic system or with its own self-contained pumping unit. Capacity is 315 tons. Openings: Two at 6″. Stroke: 12″. Press weight: 12,500 lbs. Floor space: 30″x40″. Send for catalog and engineering information on this and other R. D. Wood Presses for the rubber industry.



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LORD ANNOUNCES

new rubber-to-textile adhesive

CHEMLOK 401

- bonds Dacron *(providing high-strength adhesion for the first time!)* and nylon to uncured natural rubber, GR-S, neoprene, butyl and Buna N elastomers.
- high-strength structural adhesion — over *100 pounds per linear inch.*
- does not degrade high tensile strength of fabric in the finished product.
- excellent flex life characteristics.
- suggested uses: diaphragms, belting, hoses, air springs and similar applications.

Extensive tests on the remarkable Chemlok Adhesive 401 (non-flammable, solvent based) have indicated outstanding processing and performance advantages. Chemlok 401 is now in commercial production. For detailed technical information or evaluation samples, write Special Products Division, LORD Manufacturing Co., Erie, Pa.

Other Chemlok Adhesives:

RUBBER-TO-METAL:

Chemlok 220 bonds uncured elastomers to metals. One coat gives greater strength than two-coat conventional systems. Prime coat of new Chemlok 203 can be used for exceptional environmental resistance or minimum surface preparation.

SILICONE RUBBER:

New Chemlok 607 bonds uncured silicone rubber to metals, glass, plastics, textiles. Chemlok 614 bonds cured silicone rubber to metals. All provide extreme environmental resistance.

UNDER DEVELOPMENT:

Metal-to-metal adhesives for high-strength structural bonding. Elastomer-to-elastomer adhesives for bonding uncured synthetic elastomers to dissimilar elastomers. Available for experimental sampling.

CHEMLOK ADHESIVES

SPECIAL PRODUCTS DIVISION
LORD MANUFACTURING COMPANY
Erie, Pennsylvania

Make new friends with TITANOX*

Your plastic products will really go places when they're pigmented with TITANOX titanium dioxide white pigments. That's because nothing can surpass titanium dioxide for whitening, brightening or opacifying any type of plastic . . . vinyls, polystyrenes, cellulosics.

You will get the maximum benefits from titanium dioxide when you use TITANOX-RA. If you have a plastic pigmentation problem, consult our Technical Service Department. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y. Offices in principal cities.

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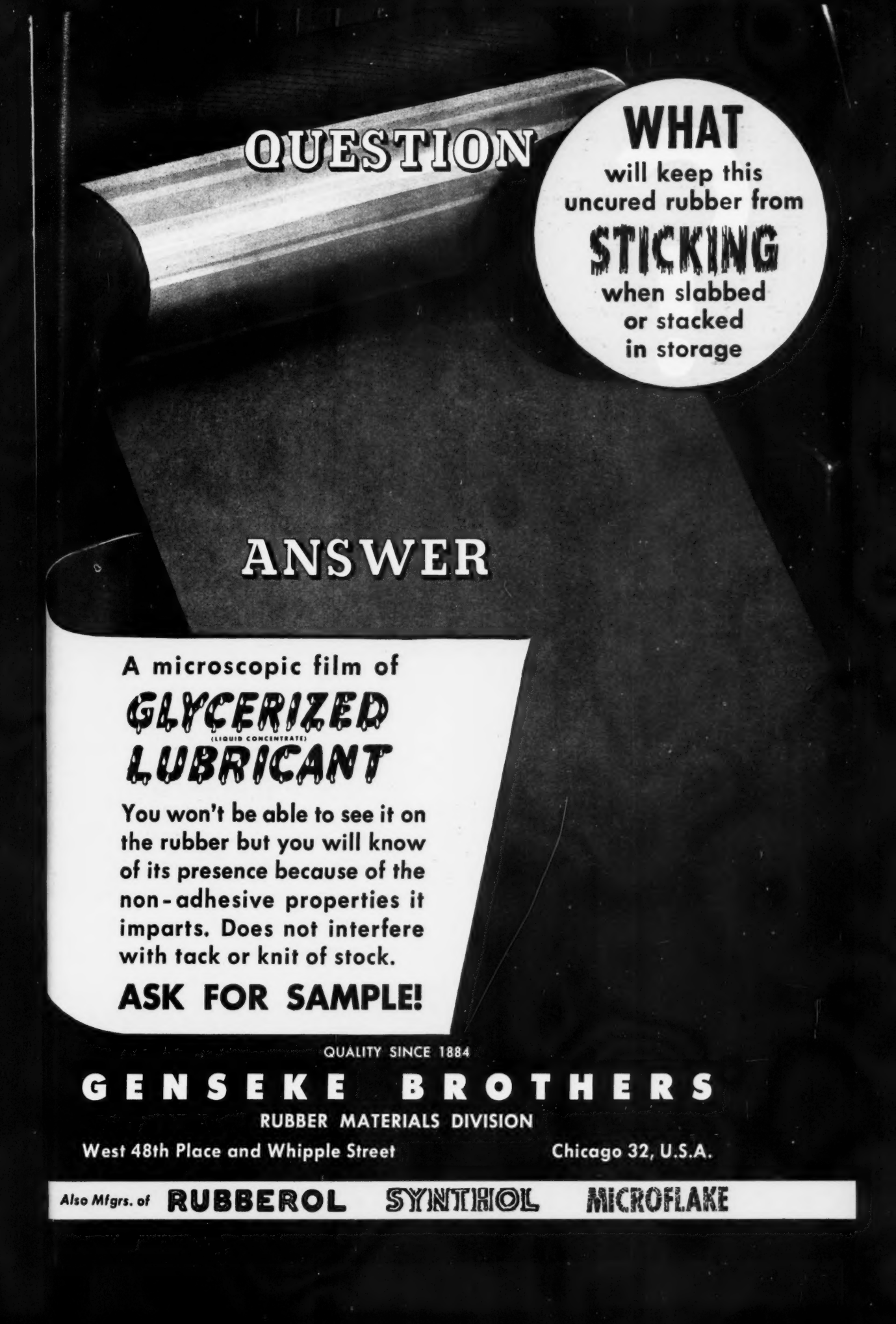
*TITANOX is a registered trade mark for the full line of titanium pigments offered by Titanium Pigment Corporation. 5213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WHAT
will keep this
uncured rubber from
STICKING
when slabbed
or stacked
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A microscopic film of
GLYCERIZED
(LIQUID CONCENTRATE)
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You won't be able to see it on the rubber but you will know of its presence because of the non-adhesive properties it imparts. Does not interfere with tack or knit of stock.
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DEPENDABILITY
are factors . . . .
Specify

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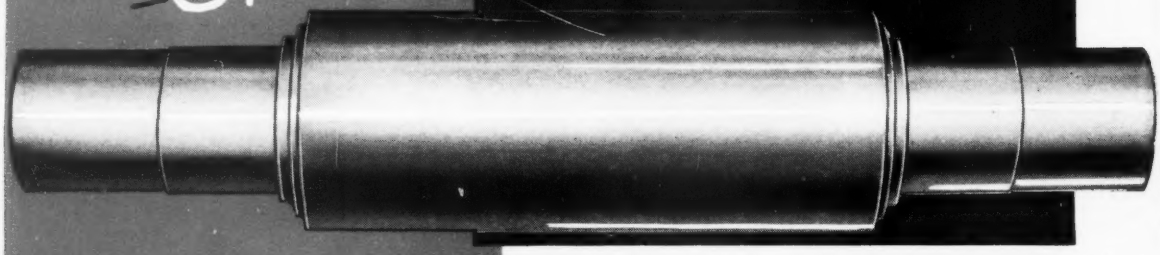
DRILLED-TYPE
ROLLS



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PLASTICS
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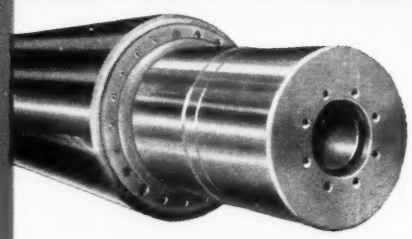
or any materials requiring close heat control



Our more than 50 years experience in the design and manufacture of rolls can be helpful in solving your processing problems. Your inquiry is solicited.

UNITED Precision Ground, DRILLED-TYPE ROLLS, the result of careful metallurgical control over raw materials, and of strict quality control in every phase of manufacture . . .

MAINTAIN A UNIFORM ROLL SURFACE TEMPERATURE throughout, with minimum deviation at any point.

ASSURE FULL RANGE HEATING and cooling over wide temperature ranges.

PROVIDE ACCURATE, QUICKLY RESPONSIVE TEMPERATURE CONTROL.

UTILIZE FULL ROLL FACE with new, ring closure type designs.

PERMIT ADJUSTMENT OF RING CLOSURE GASKET AND BOLTS, WITH ROLL IN PLACE in calender or mill, thus eliminating production downtime due to roll removal.

MAINTAIN CORRECT DEPTH OF CHILL for iron or alloy iron rolls.

ARE ENGINEERED AND DESIGNED FOR MAXIMUM HEAT TRANSFER RATE with accurately drilled, fluid passages.

UNITED

ENGINEERING AND FOUNDRY COMPANY
PITTSBURGH, PENNSYLVANIA

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Company, Inc., Aurora, Indiana

Designers and Builders of Ferrous and Nonferrous Rolling Mills, Mill Rolls, Auxiliary Mill and Processing Equipment, Presses and other heavy machinery. Manufacturers of Iron, Nodular Iron and Steel Castings and Weldments.

New FLEXOL 380—low cost answer to lacquer marring problems

Trade-Mark

Now, you can make vinyls with remarkable resistance to nitrocellulose lacquer marring with FLEXOL *plasticizer 380 and, you can do this at low cost.*

In the past, polymeric-type plasticizers were used to achieve freedom from nitrocellulose mar in vinyl plastics. Now, FLEXOL 380 gives you this outstanding mar resistance with improved low-temperature performance and efficiency—*and, at lower cost per pound.*

Tests* prove that the mar resistance of vinyls containing FLEXOL 380 is comparable to that obtained with commonly used polymeric plasticizers. Look at these results—

Plasticizers (at 50 PHR)	% Softening of N/C lacquer, 40°C. 1 Day	2 Days	3 Days
FLEXOL 380	<10	13	20
Dioctyl phthalate	45	60	57
Polymeric A	18	—	—
Polymeric B	17	—	—
Polymeric C	45	—	—

*with a Walker-Steele Swinging Beam Hardness tester

FLEXOL plasticizer 380 gives other performance characteristics typical of general-purpose phthalate plasticizers. It is completely compatible with vinyl chloride resins. With FLEXOL 380 you get the same excellent heat and light stability, good low-temperature properties, and outstanding electrical properties obtained with FLEXOL plasticizer DOP. Plastisols prepared with FLEXOL 380 are characterized by low initial viscosity and excellent viscosity stability.

This new CARBIDE plasticizer is useful in all divisions of the vinyl plastic industry where nitrocellulose mar resistance is a factor. Typical of the products that may benefit by the use of FLEXOL 380 are

- *lamp and clock cord*
- *furniture and automotive upholstery*
- *doll parts*
- *handbags*
- *outerwear jackets*
- *tablecloths and place mats*
- *vinyl balls and sponges*

Write for samples and technical information today. Address Union Carbide Chemicals Company, Department B, Room 328, 30 East 42nd Street, New York 17, New York. In Canada: Carbide Chemicals Company, Division of Union Carbide Canada Ltd., Toronto.

"Flexol" is a registered trade-mark of Union Carbide Corporation.

UNION CARBIDE

CHEMICALS

Union Carbide Chemicals Company
Division of Union Carbide Corporation
30 East 42nd Street, New York 17, N. Y.

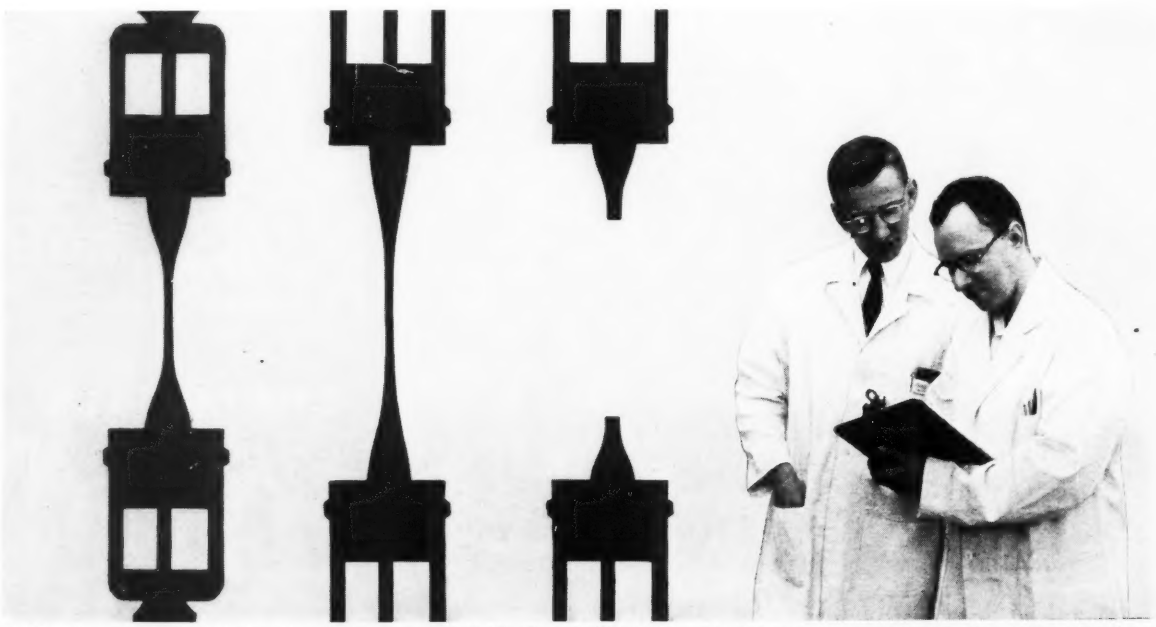
Flexibilizing synthetic rubber for use with solvents

Under solvent attack, plasticized rubbers often lose their flexibility. From 3M comes Turpol® NC-1200, a softening agent developed specifically to resist solvent action

Here is a practical answer to the problem of maintaining flexibility in synthetic rubber under prolonged exposure to solvents . . . Turpol NC-1200, a non-leachable 3M plasticizer. By adding Turpol to the formulation, softness is achieved and maintained in the base rubber despite solvent action. What's more, Turpol will not reduce the solvent resistance of the base rubber itself.

Turpol's advantages are best shown by a direct comparison. For example, standard formulation of unplasticized rubber is too hard for many applications. Under solvent exposure, swelling is pronounced.

With vulcanized vegetable oils added to the formulation, the rubber is plasticized to an extent; but after solvent attack the rubber hardens and actually loses strength. Another undesirable effect is the degree of



Rubber becomes soft, but stays tough, when non-leachable Turpol NC-1200 is added. Even after soaking in solvent, Turpol-softened rubber (center) stretches far more than unsoftened rubber (left), yet does not break like rubber softened with vulcanized vegetable oils.

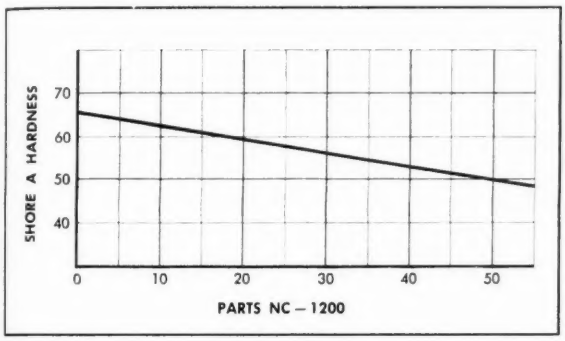
swelling—far greater than that which occurs in Turpol-softened rubber, or formulations without any plasticizer at all.

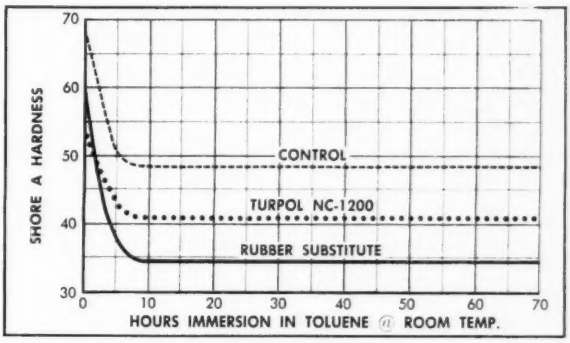
The over-all result of adding Turpol is to increase the service life of rubber in applications where it is necessary to maintain flexibility despite the presence of solvents. Turpol is already being used in formulations for printing rolls and blankets, gas and oil hose and tanks, compounds, gaskets, tank lining materials, diaphragm cloth and rubber gloves.

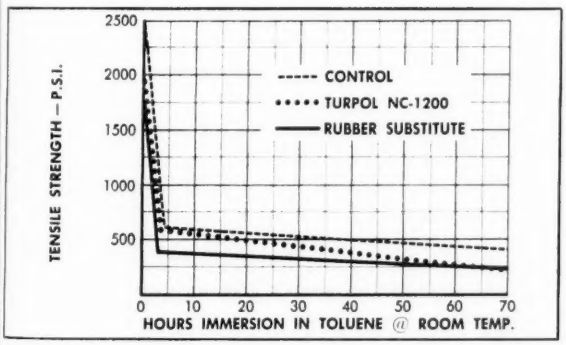
Turpol is compatible with Thiokol, Hypalon, Neoprene, and nitrile rubbers, and is especially useful in compounding low durometer stocks. It is available in slabs and is milled into the base rubber with standard equipment.

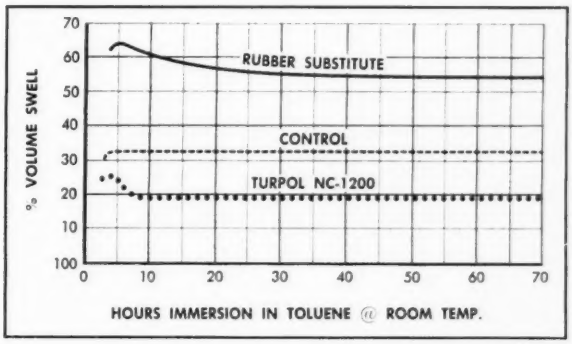
For complete data on non-leachable Turpol NC-1200 —applications and formulations—fill out the coupon below and mail it today.

How Turpol NC-1200 affects hardness, tensile strength and volume swell









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MINNESOTA MINING AND MANUFACTURING COMPANY

St. Paul 6, Minn.

... where Research is the key to tomorrow

3M COMPANY CHEMICALS

Irvington Chemical Division, Dept. WH-107, Chemical Products Group, MINNESOTA MINING AND MANUFACTURING COMPANY, St. Paul 6, Minnesota.

Please send latest data on Turpol NC-1200, non-leachable rubber plasticizer. I (do) (do not) wish a Field Engineer to call.

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE____

Goodrich-Gulf Chemicals, Inc.

NOW AVAILABLE:

Ameripol rubber in two forms to suit your processing

AS A RESULT of Goodrich-Gulf research and development, hot polymer grades of Ameripol man-made rubber are now available in "crumb" form as well as in molded bales long familiar to all processors of rubber products.

"Crumb" rubber can be put easily into solution—for products like adhesives, mastics, cements—without prior milling operations. Time and costs are saved.

Pressed bales for making molded and extruded products—dusted and bagged. Also wrapped in plastic film—ready to feed directly into mixing equipment in your plant.

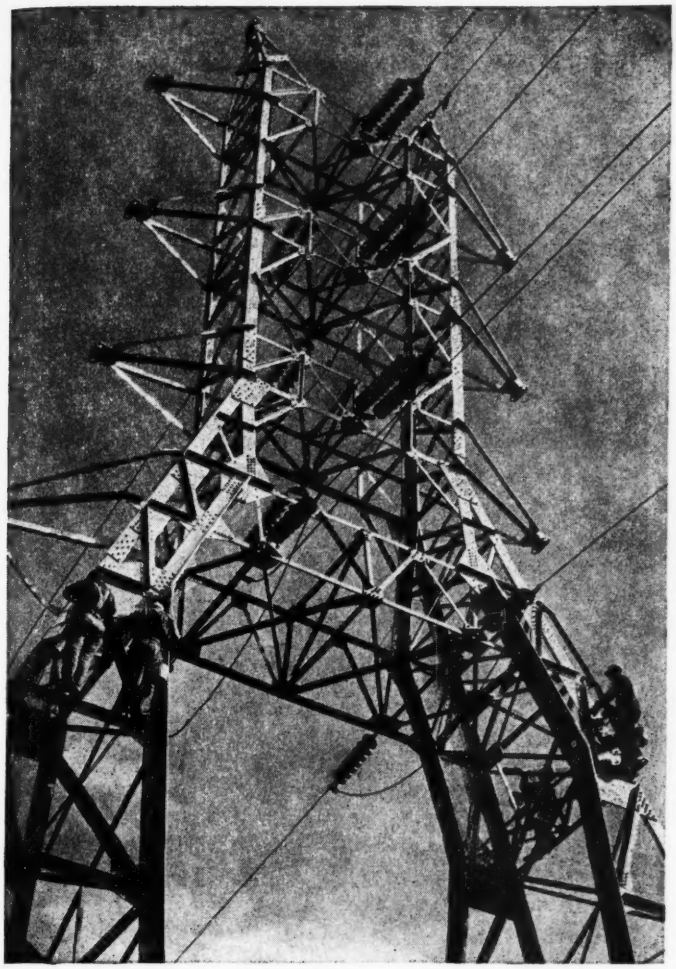
In product *quality, service,* and *ease of processing* you'll find Ameripol the preferred rubber for your needs. Contact us for your requirements.

THE NAME TO REMEMBER FOR QUALITY BACKED BY YEARS OF RESEARCH AND EXPERIENCE

Ameripol RUBBER

Cold Non-Oil Polymers
•
Cold Oil-Extended Polymers
•
Hot Non-Oil Polymers

Goodrich-Gulf Chemicals, Inc.
3121 Euclid Avenue • Cleveland 15, Ohio



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for Fast and Smooth Extrusion of Electrical Insulation and Jacketing Compounds!

Marbon "8000-AE"®

REINFORCING HIGH STYRENE RESIN

The Superior Electrical Grade Resin!

- **SUPERIOR ELECTRICAL PROPERTIES**
- **LESS SCORCH**
- **INCREASED TOUGHNESS**
- **GREATER TEAR-RESISTANCE**

America's foremost electrical insulation suppliers have demonstrated the complete dependability of Marbon 8000-AE for fast mixing; smooth, easy extrusion and shrink-free calendering of electrical insulations, jackets and sheet stock. Marbon 8000-AE has proved time and again to be the superior electrical grade resin because it has all the reinforcing properties of world-famous Marbon 8000-A.

Get the Facts . . .

Write **TODAY** for complete TECHNICAL LITERATURE

MARBON CHEMICAL
Division of **BORG-WARNER**
GARY, INDIANA

MARBON . . . It BLENDS as STRENGTHENS as it IMPROVES

NEWS...from TEXUS
TO:
SUBJECT:
NEWS...from TEXUS
NEWS...from TEXUS
TO: Rubber Product Manufacturers
SUBJECT: New Technical Bulletin
Opposite page shows the cover of a just-issued 9-page Bulletin on New Improved, light-colored SYNPOL 1708.
First of a series of Technical Bulletins from TEXUS, it contains complete data on this improved polymer for your easy reference.
A note to your TEXUS representative or our New York office will bring you your copy of this comprehensive SYNPOL 1708 Bulletin, including specifications, physical and chemical properties, applications and actual cost-tested compounding formulas.

SEND FOR YOUR COPY TODAY!

TEXUS

TECHNICAL DATA

SYNPOL 1700 Series — Cold, Oil-Extended Polymers

BULLETIN NO. 1
September 23, 1957

SYNPOL 1708 - NEW IMPROVED LIGHT-COLORED, COLD, OIL-EXTENDED POLYMER

New Improved SYNPOL 1708 is an exceptionally stable, light-colored, cold, oil-extended polymer with many properties formerly found only in premium-priced rubbers.

It has been developed by the use of a new non-staining anti-oxidant, new plant facilities and a new non-volatile light-colored naphthenic oil used exclusively by TEXUS.

This new, unique oil is specially refined from carefully selected naphthenic crudes and is comparable in volatility to the previously used dark extending oils. This development allows *complete interchangeability* of the New Improved SYNPOL 1708 rubber formulations with the previously used GRS-1708, and eliminates processing problems caused by the volatility of other currently used light-colored oils.

Although SYNPOL 1708 is particularly suited for application in bright and light-colored stocks, its use is not confined to these and it may be used equally well in stocks of any color. This feature offers an additional economy since the number of raw polymers necessary for inventory purposes may be reduced.

New Improved SYNPOL 1708 is non-discoloring and non-staining so that bright, delicate shades of color in compounded stocks persist through their vulcanization and subsequent exposure to severe service conditions.

It also contains an effective, non-staining, non-discoloring stabilizer which insures maximum protection against oxidative degradation during the warehousing and storage of the raw polymer, as well as in subsequent processing which may be under high-temperature conditions.

The polymer is produced by cold polymerization and shows the excellent tensile strength, abrasion resistance and flexing characteristics inherent in cold polymers. Glue-acid coagulation, together with other controlled conditions of manufacture, insures a minimum of residual water-soluble ash which produces a rubber with extremely low water-absorption characteristics as required for electrical and other special applications.

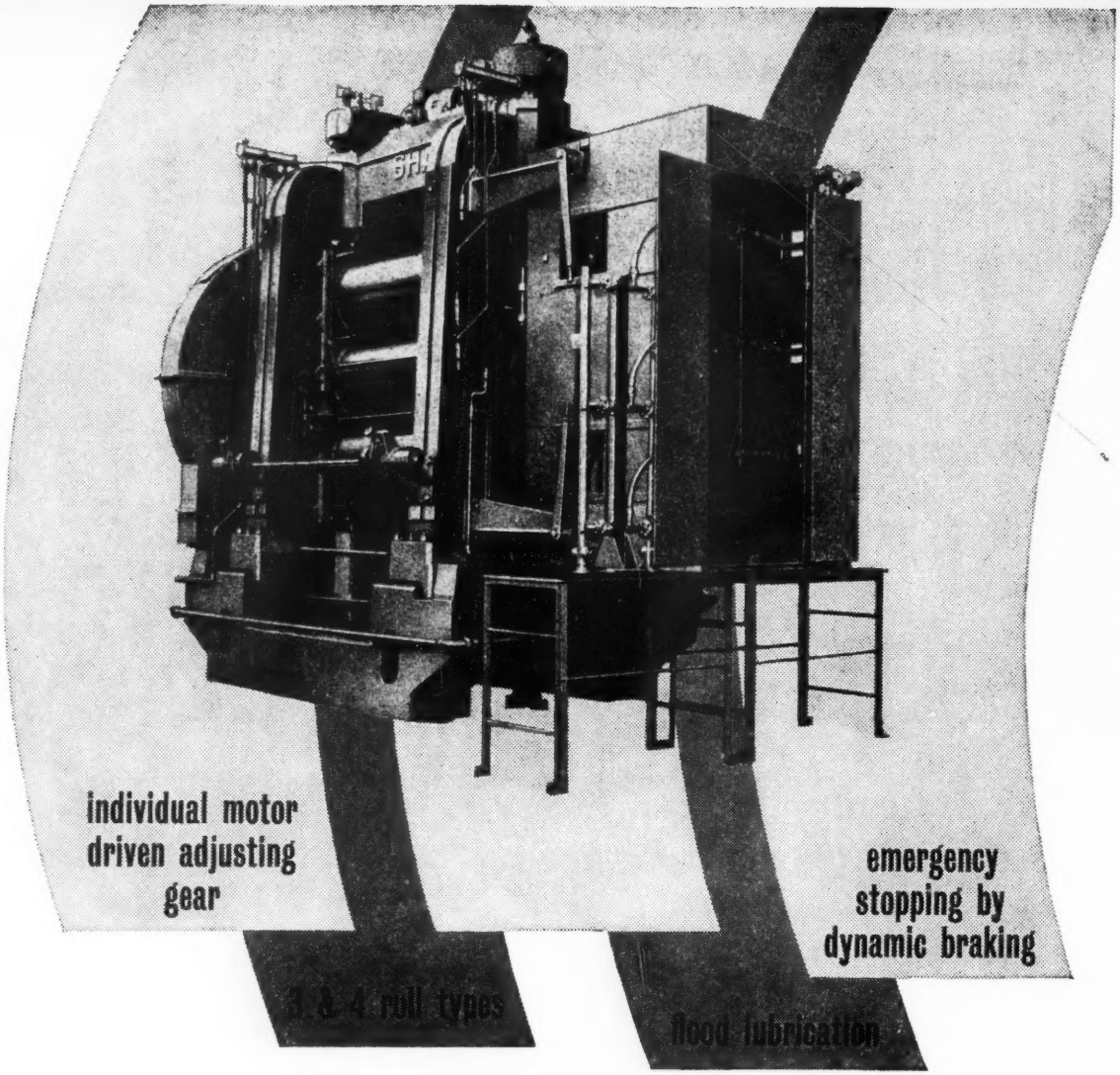
New Improved SYNPOL 1708, being oil-extended, offers all of the characteristics of economy and ease of processing of such polymers in general. It is emulsified during manufacture with fatty acid soap and is, therefore, free from any undue tack or stickiness when milled. For the same reason, its cure is not retarded.

New Improved SYNPOL 1708, is a widely versatile polymer and is suited for use in a variety of products including white, pastel or brightly colored stocks. Some of its typical applications are as follows:

Molded Shoe Soling
Wire Insulation and Jacket Stocks
Gaskets, Hose and Packing
Wringer Rolls
Proofed Fabrics
Floor Tile
Molded and Extruded Goods

TEXAS - U. S. CHEMICAL COMPANY
260 Madison Avenue, New York 16, N. Y.

GENERAL OFFICES AND PLANTS: PORT NECHES, TEXAS • SALES AGENT: NAUGATUCK CHEMICAL, NAUGATUCK, CONNECTICUT



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Shaw's outstanding design, combined with
77 years' experience and skill, has resulted in a range of
calenders representing the most advanced features
for modern production.

SHAW EXPERIENCE is at your service for advice on plant and layout

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Enquiries to **FRANCIS SHAW (CANADA) LIMITED GRAHAM'S LANE BURLINGTON ONTARIO CANADA**
P.3797

AMOCO CHEMICALS

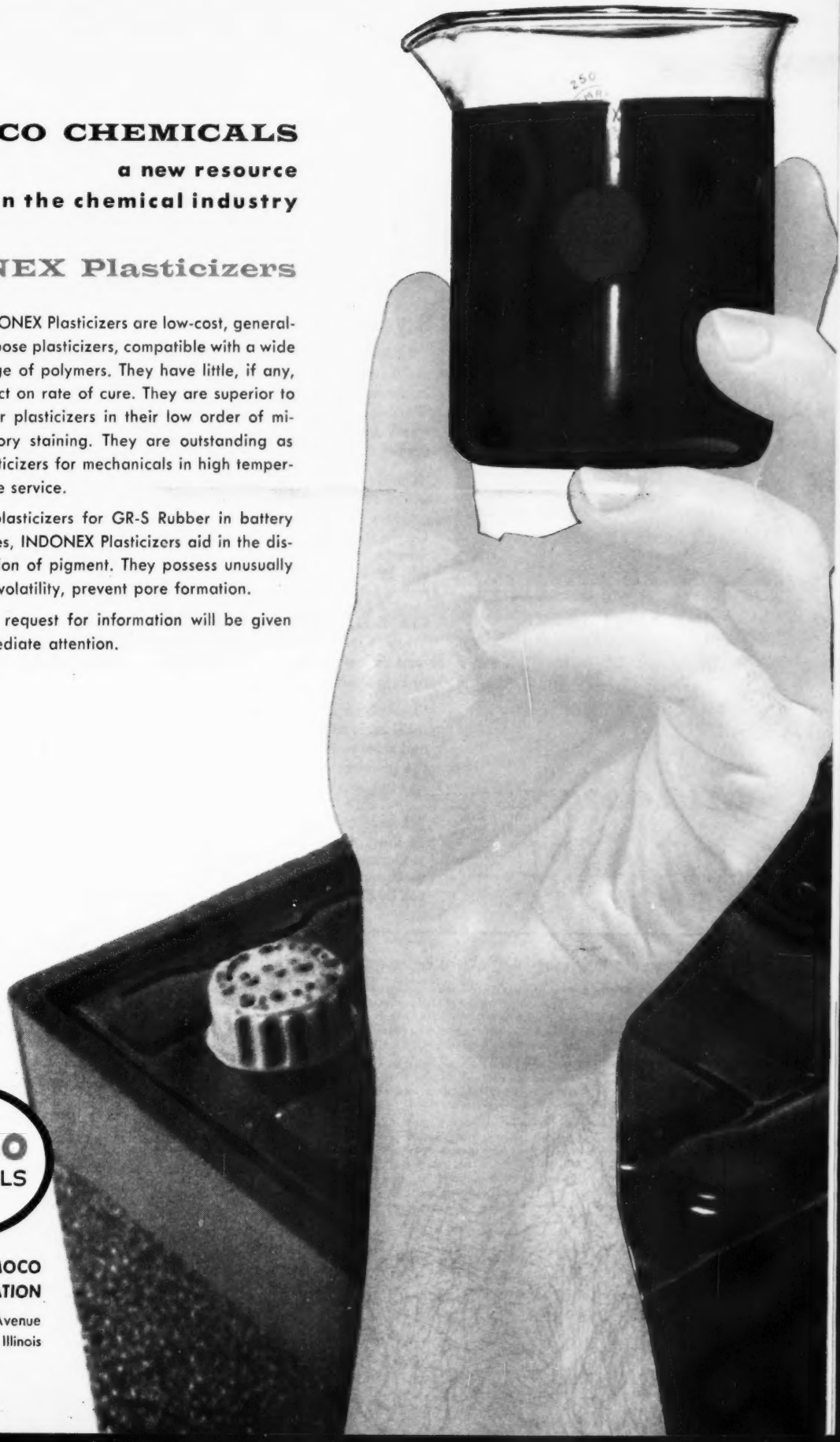
a new resource
in the chemical industry

INDONEX Plasticizers

INDONEX Plasticizers are low-cost, general-purpose plasticizers, compatible with a wide range of polymers. They have little, if any, effect on rate of cure. They are superior to other plasticizers in their low order of migratory staining. They are outstanding as plasticizers for mechanicals in high temperature service.

As plasticizers for GR-S Rubber in battery boxes, INDONEX Plasticizers aid in the dispersion of pigment. They possess unusually low volatility, prevent pore formation.

Your request for information will be given immediate attention.



AMOCO CHEMICALS

AMOCO CHEMICALS CORPORATION
910 South Michigan Avenue
Chicago 80, Illinois

Can specialized business publication advertising actually sell?

By reputation, salesmen are reluctant to credit anything but their own selling efforts for getting names on the dotted line.

Actually, it's quite a different story. The most successful salesmen will tell you two important things about selling. 1. That the selling process is largely a matter of communicating ideas. 2. And that specialized business publication advertising can help importantly to register information with prospects.

Of course each salesman will express this in his own way . . . but they all agree that selling would be far more difficult without the advertising that appears in the industrial, trade and professional publications that serve the specialized markets to which they sell.

Here, for instance, is what a salesman has to say about this kind of advertising:

Fred Snyder, Cleveland District
Worthington Corporation

sells to industry

Says Mr. Snyder:

"We have, of course, sales leads from our business paper advertising that are forwarded to us on a monthly basis. But also the trade advertising has its impact on many who do not at the time request specific information. Worthington is far better known today than it was five years ago, due in no small measure to the aggressiveness of its advertising and sales promotion department.

"Their work makes my job easier. First of all, we have an entree in companies where some Worthington products were not previously as well-known as our original line. We're getting a lot better sales coverage on all products. The Corporation manufactures so many products today that even regular customers may be unfamiliar with some of these products. Through trade advertising and sales promotion we have been able to sell the whole Worthington line.

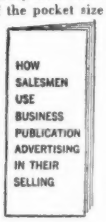
"Getting back to sales leads—they are particularly helpful to our dealers. In Cleveland, W. M. Patterson Supply will undoubtedly receive inquiries from Worthington's advertising. Scott-Tarbell, Inc., Cleveland Oak Belting, or other dealers handling special product lines will pick up leads from our advertising to help them get business.

"I think we've grown eightfold since the war. This year we hit two hundred million. It used to be that twenty-five million was a good year. The advertising and sales promotion department has aggressively been attacking their part of the problem within the last five years. Prior to that the name Worthington was not nearly so well-known and we put much less emphasis on advertising."

Ask your own salesmen what your company's business publication advertising does for them. If their answers are generally favorable you can be sure that your business publication advertising is really helping them sell. If too many answers are negative it could well pay you to review your advertising objectives—and to make sure the publications that carry your advertising are read by the men who must be sold.

How salesmen use their companies' advertising to get more business

Here's a useful and effective package of ideas for the sales manager, advertising manager or agency man who would like to get more horsepower out of his advertising. Send for a free copy of the pocket size booklet entitled, "How Salesmen Use Advertising in Their Selling," which reports the successful methods employed by eleven salesmen who tell how they get more value out of their companies' advertising.



You'll find represented many interesting variations in how they do this. Some are very ingenious; all are effective. You can be sure that more of your salesmen will use your advertising after they read how others get business through these simple methods.

The coupon is for your convenience in sending for your free copy. Then, if you decide you want to provide your salesmen with additional copies, they are available from NBP Headquarters in Washington, at twenty-five cents each. Or, if you choose you can reprint the material yourself and distribute it as widely as you please. But first, send for your free copy.

NATIONAL BUSINESS PUBLICATIONS, INC.
Department 2E
1413 K Street, N. W.
Washington 5, D. C. STerling 3-7533

Please send me a free copy of the NBP booklet "How Salesmen Use Advertising in Their Selling."

Name _____

Title _____

Company _____

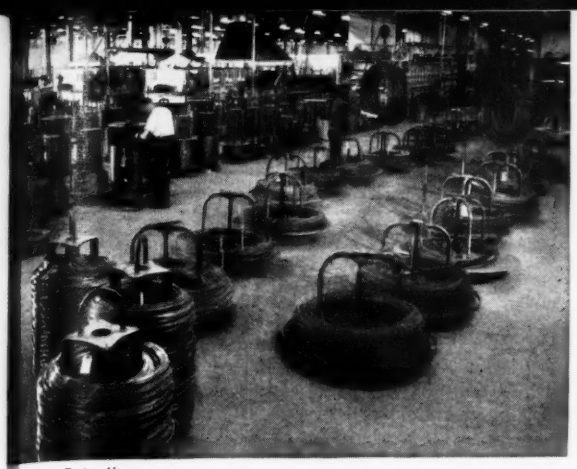
Street Address _____

City _____ Zone _____ State _____

National Business Publications, Inc.

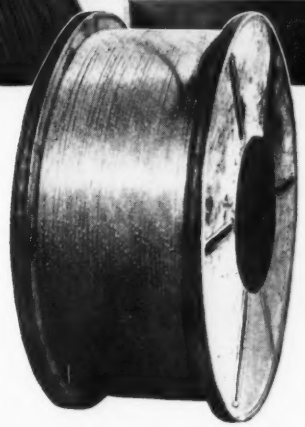
NBP

. . . each of which serves a specialized market in a specific industry, trade or profession.



Wire Patenting

Wire Drawing



Where economy in . . .

WIRE FOR RUBBER *begins*

You and we at National-Standard know that there's a lot about the quality and behavior of wire that cannot be determined by specifications or spot checks. It's possible, perhaps, but hardly practical.

And it's in this area of "immeasurables" that National-Standard methods, specialized experience, research and unusual control show up time and again to customers' advantage.

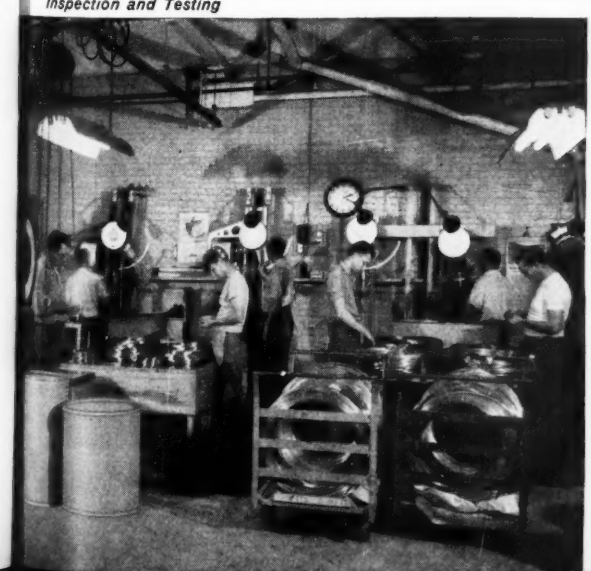
These advantages are *plus* economies that originate in the various National-Standard operations . . . from the exacting selection of basic materials, on through every step of processing, to the development of final surface and finish qualities.

Take full advantage of National-Standard's two-way policy—first, to provide exceptional technical service aimed at matching wire behavior to requirements . . . and second, to produce the wire you need with extreme fidelity and *plus economies!*

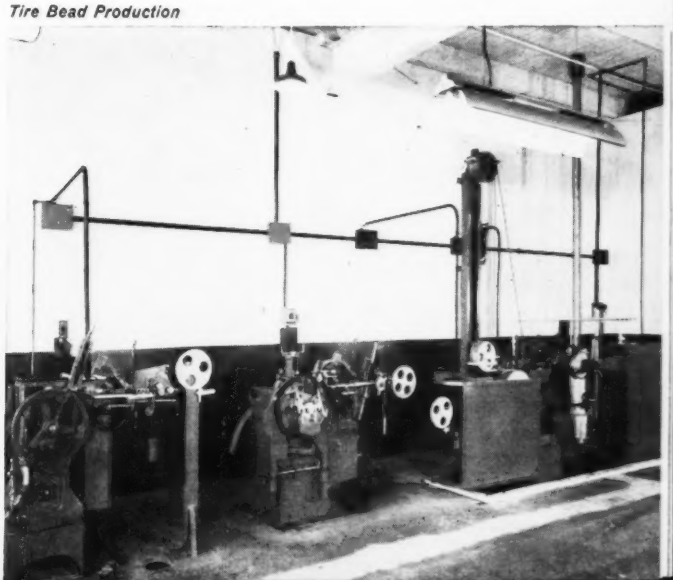
NATIONAL NS NATIONAL-STANDARD Company **STANDARD**

DIVISIONS: NATIONAL-STANDARD, Niles, Mich.; *tire wire, stainless, music spring and plated wires* • WORCESTER WIRE WORKS, Worcester, Mass.; *music spring, stainless and plated wires, high and low carbon specialties*
WAGNER LITHO MACHINERY, Secaucus, N. J.; *metal decorating equipment* • ATHENIA STEEL, Clifton, N. J.; *flat, high carbon spring steels* • REYNOLDS WIRE, Dixon, Ill.; *industrial wire cloth*

Inspection and Testing

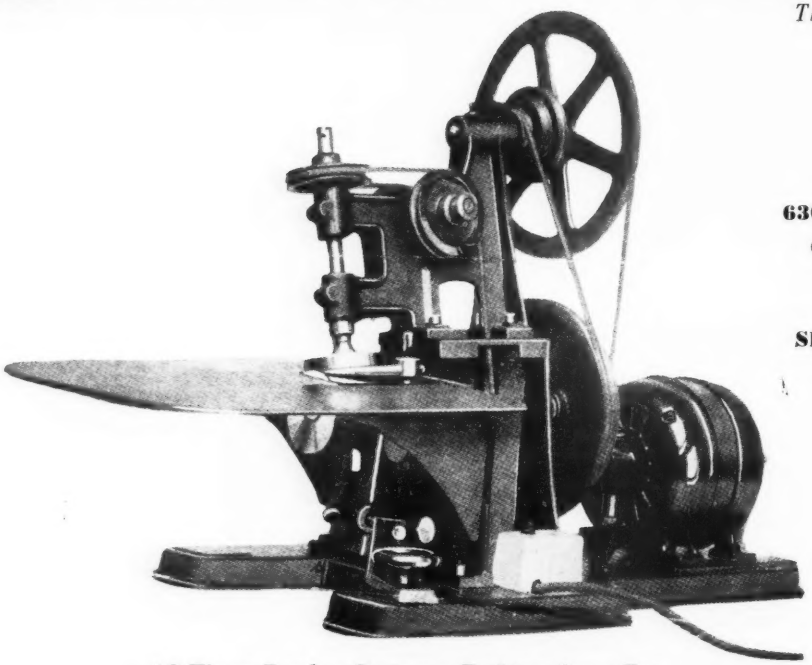


Tire Bead Production



TW MORRIS TRIMMING MACHINES

The World's Trimmers



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Telephone
SHELDRAKE 3-1221

CABLE "MORTRIM"

#8 Water Bottles, Syringes, Bathing Caps, Etc.

Factice
THE STAMFORD RUBBER SUPPLY CO.
Vulcanized Oil

THE STAMFORD RUBBER SUPPLY CO.

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A COMPLETE LINE OF
WHITE
BROWN
and AMBER
GRADES

OLDEST AND LARGEST MANUFACTURERS OF Factice VULCANIZED OIL SINCE 1900

LEADERS IN THE FIELD
For
RESEARCH and
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THE STAMFORD RUBBER SUPPLY COMPANY, STAMFORD, CONN.

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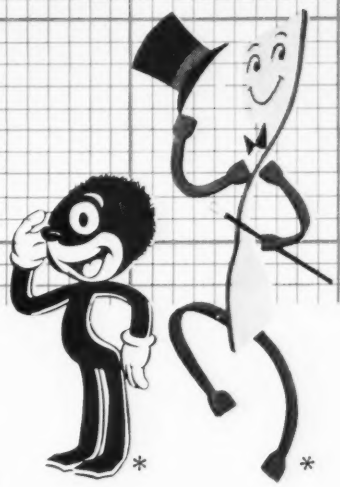
RUBBER CHEMICALS
NEWS ITEM NO. 7



Remarkable Versatility Achieved with PHILPRENE* 1803

Philprene 1803 in your rubber products enables you to manufacture a wide selection of competitive stocks of outstanding quality. Containing 25 parts of highly aromatic oil and 50 parts of Philblack* O, Philprene 1803 produces extremely high quality compounds. By taking advantage of the inherent excellent properties of Philprene 1803, you can add larger volumes of pigments and plasticizers to reduce compound costs for a wide range of competitive products.

Philprene 1803, with carbon black and oil already incorporated, is ideal for open mill mixing in plants where black contamination is a problem.

The data, opposite, illustrate the range of physical properties attainable with Philprene 1803 stocks of approximately 60 durometer hardness.

*A Trademark

	A	B	C	D
Philprene 1803	175	175	175	175
Hard Clay	40	30	30	50
Whiting	—	50	100	200
Zinc Oxide	4	4	4	4
Stearic Acid	2	2	2	2
Agerite Superlite	1	1	1	1
Circosol 2XH	20	20	20	25
Resinex Flakes	—	—	—	25
Sulfur	2.25	2.25	2.5	3
Santocure	1.7	1.7	1.8	2
DPG	0.5	0.5	0.5	0.5
	246.45	286.45	336.8	487.5
Mooney, ML-4-212°F	51	55	53	54
Tensile Strength, psi	2575	2040	1760	980
Elongation, %	525	485	470	555
Shore A Hardness	59	61	61	60
Compression Set, %	22.3	26.4	25.8	41.2
Tensile Strength, psi (Aged)	2000	1630	1520	790
Elongation, % (Aged)	330	300	305	330

Samples aged 70 hours at 212°F

For the Philprene best suited and most profitable for your purpose, refer to our new Philprene Polymer Brochure or consult your Phillips representative. He will be glad to assist you in solving your compounding and processing problems. Take advantage of Phillips experience with rubber. It's an important part of Phillips service.

PHILLIPS CHEMICAL COMPANY
Rubber Chemicals Division
318 Water Street, Akron 8, Ohio

District Offices: Chicago, Providence and Trenton

Manufacturers of CANARY LINERS

Mildew-proofing *and* Flame-proofing Cotton Fabrics as per Government Specifications. *Write or Wire for Samples and Quotations.*

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Columbian Carbon (Canada) Ltd.
Carbon Black and Pigment Division
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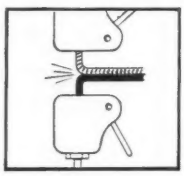
Toronto 14, Ontario, Canada

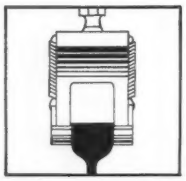
J. J. WHITE Products Co.

7000 UNION AVENUE
CLEVELAND 5, OHIO

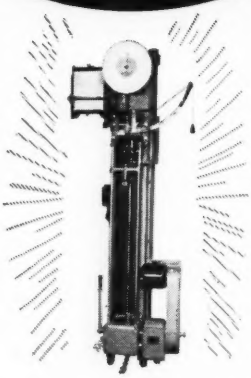
SCOTT TESTER* L-6 makes many tests



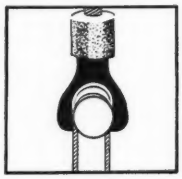
With Lord Adhesion Clamp for evaluating rubber-to-metal bond in accordance with ASTM D412.



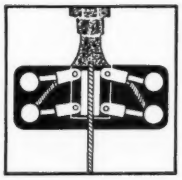
With Z1 Clamp for evaluating D15 dumbbell specimens in accordance with ASTM Specification D412.



With Ring Test Spool for circular packings, finger cot sections and the European ring specimen method.



With Bureau of Standards Toggle Clamp for straight specimens such as wire and cable insulation per ASTM D470.



Write for data on these and numerous other L-6 tests.

SCOTT TESTERS*

World-standard for testing elastomers in conformity with ASTM Specifications.

SCOTT TESTERS, INC. 90 Blackstone St. Providence, R. I.

*Registered Trademark

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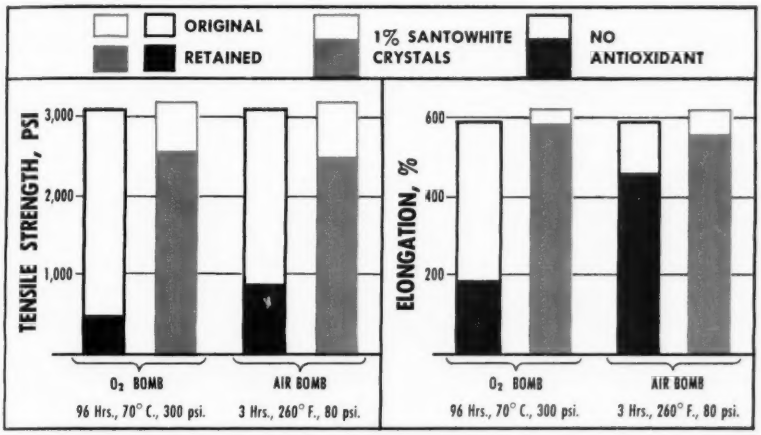
Representatives in Foreign Countries

Another first from Monsanto

SANTOWHITE CRYSTALS... unique, bridged-phenol antioxidant for light-colored rubber and latex compounding



Results of air bomb and oxygen bomb tests show how effectively Santowhite Crystals protect the original properties of a natural rubber stock.

SANTOWHITE "Crystals" was the first *thio* bisphenol-type antioxidant . . . and it offers some important benefits to draw upon in the complicated business of devising compounds that work.

Most important, of course, is that SANTOWHITE Crystals can be used in white or light-colored stocks based on both natural and on most synthetic rubbers; it does not "dye" the compound. Next, this hindered phenol is nonstaining to lacquered and enameled surfaces that must contact the finished rubber part . . . so it has its place, too, in dark-colored compounds where heat and oxidation resistance are needed but staining danger cannot be risked.

Although each rubber formulation performs differently, here is what you can obtain by adding 1 part per hundred parts of rubber: markedly less loss of tensile strength and elongation from heat exposure; improved retention of resilience over the service life of the compound; retarded stress decay.

SANTOWHITE Crystals is essentially 4,4′-thiobis-(3-methyl-6-tert.-butylphenol). Chemically stable, it does not react with other conventional compounding ingredients, does not activate or retard the cure, gives positive protection.

If you want heat-oxidation resistance in a latex, for example, you'll find that SANTOWHITE Crystals give the cured compound the best protection available where discoloration and staining cannot be tolerated. In foam, rug backing and dipped goods, SANTOWHITE provides good protection against "aging" degradation. In fact, this antioxidant, in most applications, is perhaps the most powerful oxidation protectant of the nonstaining, non-discoloring type in industry.

Whenever you need a nonstaining, non-discoloring antioxidant, try SANTOWHITE Crystals in the range of 1-2% on the rubber. Monsanto's compounding specialists will be happy to work with you on your specific formulation.

Accelerators
—For fast, slow and regulated rates of safe cure.

Antioxidants
—For positive protection against oxidation degradation.

Plasticizers

Specialty Processing Compounds

Santowhite—T.M. Monsanto Chemical Company

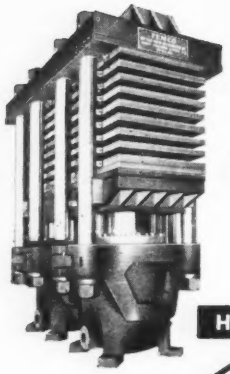
For further information, write us or call:
MONSANTO CHEMICAL COMPANY
Rubber Chemicals Department
Akron 11, Ohio Telephone: HEmlock 4-1921
In Canada: Monsanto Canada Ltd., Montreal

Monsanto®

ERIE ENGINE & MFG. CO.

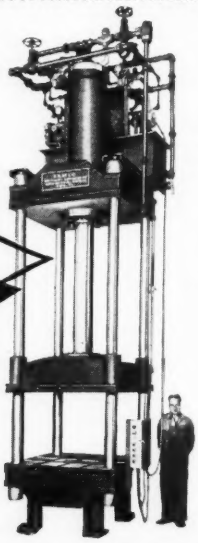
PROCESSING MACHINERY

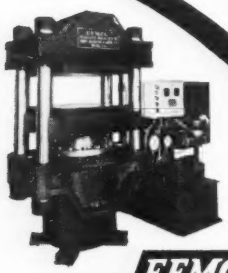
. . . for RUBBER • PLASTICS • REINFORCED PLASTICS • LAMINATING
HARDBOARD and other WOOD PRODUCTS INDUSTRIES



HYDRAULIC PRESSES

LAMINATING
COMPRESSION MOLDING
REINFORCED FIBERGLASS MOLDING
TRANSFER MOLDING
HARDBOARD
PLYWOOD



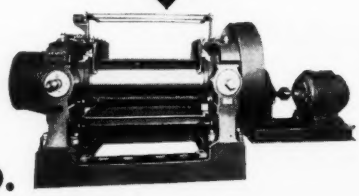


Investigate the EEMCO line before you buy. We welcome your invitation to visit your plant to discuss your problems.

EEMCO Heavy Duty Presses specially designed and built to suit your requirements, cost no more.

MILLS

LABORATORY MILLS
& PRODUCTION MILLS
UP TO 84"



EEMCO ERIE ENGINE & MFG. CO.

951 East 12th St., ERIE, PA.

SYNTHETIC RUBBER

CRUDE RUBBER

LIQUID LATEX

NEVILLE CHEMICALS

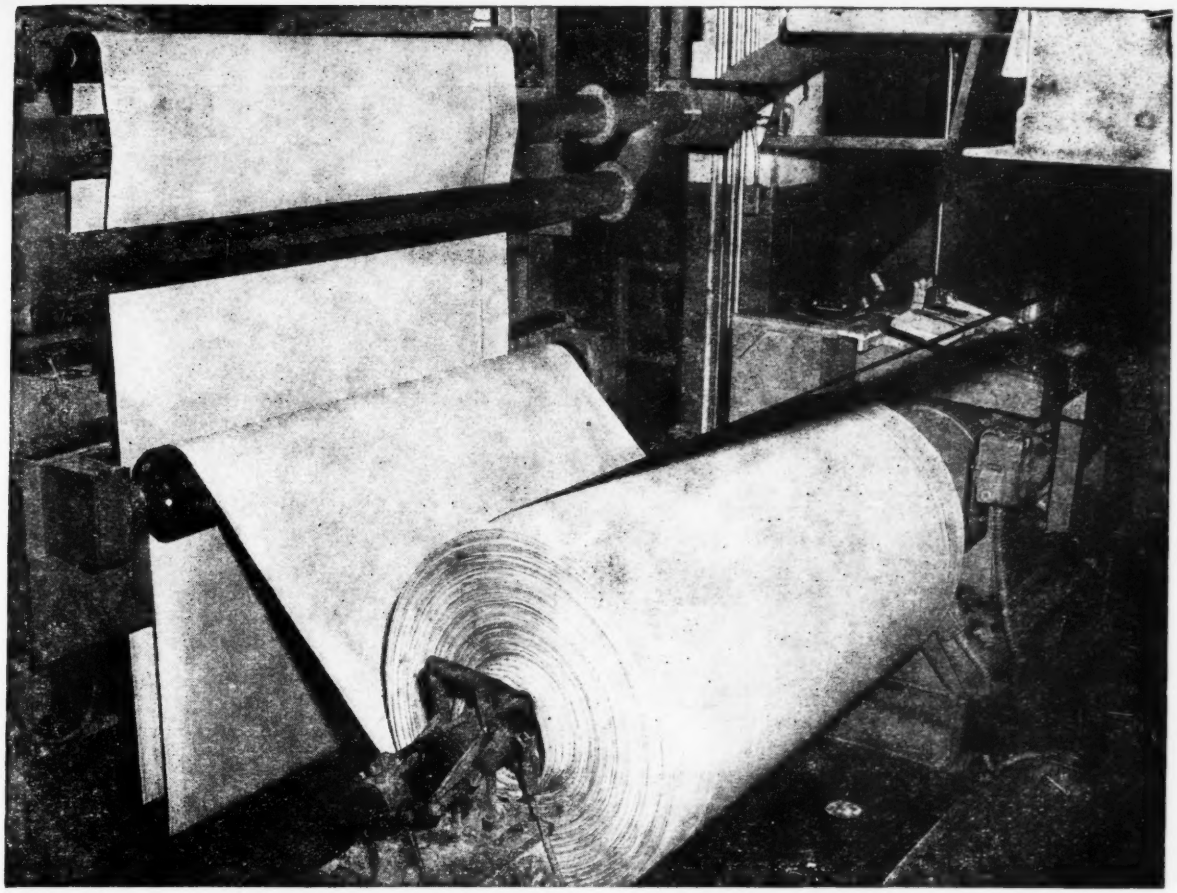
E. P. LAMBERT CO.

FIRST NATIONAL TOWER — AKRON 8, OHIO

HEmlock 4-2188

Member — Commodity Exchange, Inc.,

COUMARONE RESINS
RECLAIMING OILS
PLASTICIZERS
POWDERED RUBBER



CLIMCO PROCESSED LINERS

Pay Off—In Any Width

Regardless of the width of your stock, roll it into a Climco Processed Liner when it leaves the calender. For handling any size stock, Climco Processed Liners pay off in faster, lower cost production.

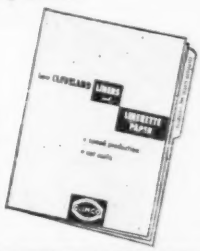
Climco Processed Liners preserve tackiness, eliminate lint and ravelings. And new minimums are established for stock losses because gauge distortion is permanently eliminated. Climco Processed Liners help keep production going smoothly. Climco Processing—for more than 31 years giving the rubber industry a superior liner—is carefully applied by expert craftsmen using only proved ingredients. As a result, your liners last longer—years longer.

Try Climco Processed Liners in your plant. Find out why more and more companies in the rubber industry are standardizing on Climco.

THE CLEVELAND LINER & MFG. CO.
5508 Maurice Ave. • Cleveland 27, Ohio

GET THE FULL STORY ON CLIMCO PROCESSING

Illustrated booklet tells about Climco Liners and Linerette separating paper. Tells how to get better service from liners. Write for your copy now.



LINERETTE INTERLEAVING PAPER
Treatment Contains
NO OIL OR WAX
Samples on Request

CLIMCO
PROCESSED LINERS

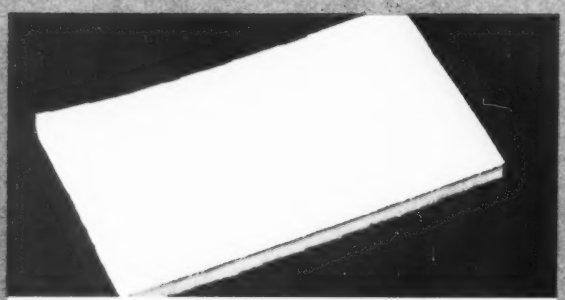
FOR FASTER, BETTER PRODUCTION AT LOWER COST

NEW!

Be sure the polymer you use contains CIRCOSOL NS

SUNOCO®

UNEXPOSED TO ULTRAVIOLET



There's no stain here, because this sample contains no oil, has not been exposed to ultraviolet.

In this unexposed sample containing 37.5 parts of Circosol NS, there's still no sign of stain.

CIRCOSOL NS

combines *easy processing* with outstanding non-staining properties

Sunoco's newest rubber process aid is compatible with butadiene-styrene polymers and natural rubber

Sunoco's new CIRCOSOL NS offers long-sought possibilities for oil-extending light-colored rubbers and polymers. And here's the big news: Extended with CIRCOSOL NS, polymers retain optimum processibility.

CIRCOSOL NS is shown at the left, photographed in its own natural pale color. This highly refined naphthenic oil, non-volatile for high-temperature processing, gives excellent low-temperature properties to your finished products. This advantage, combined with the outstanding non-staining properties of CIRCOSOL NS, adds up to the ideal low-cost extender for the production of light-colored rubber goods.

For test samples, technical bulletin or prices, see your Sun representative, or write to Dept. I-8.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL
IN BRITAIN: British Sun Oil Co., Ltd., London W.C.2, England. THE NETHERLANDS: Netherlands Sun Oil Co., Rotterdam C. The Netherlands. WESTERN EUROPE (except the Netherlands), NEAR EAST, NORTH AFRICA: Sun Oil Co. (Belgium) S.A., Antwerp, Belgium. Agents and distributors throughout the free world. © Sun Oil Co., 1957.

Circosol and Sun are Registered Trademarks

EXPOSED TO ULTRAVIOLET

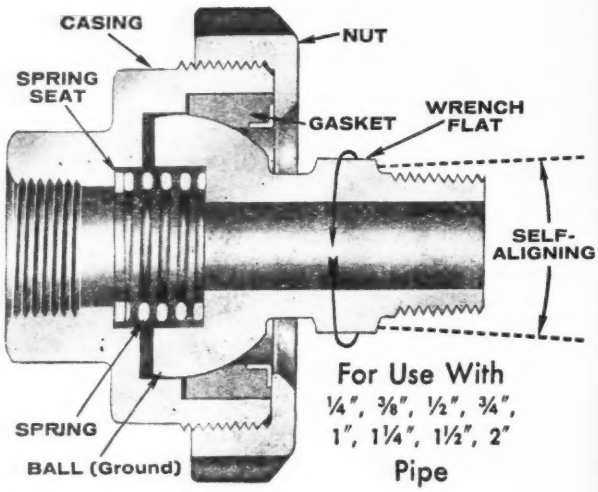
After exposure to ultraviolet at 150 F for 24 hours, this oil-free vulcanizate shows very little stain.

This sample with 37.5 parts of Circosol NS looks virtually the same as sample with no oil at all!

Why The Electric Auto-Lite Company Now Uses Barco Swivel Joints

BEFORE—Service life of only three or four months made maintenance of hose connections on presses an expensive nuisance. Idle presses earn no noney.

AFTER—Replacement with Barco Swivel Joints and permanent metal pipe virtually ended maintenance. The user reports, "JOINTS O.K.; HAVE REPLACED VERY FEW IN THREE YEARS' OPERATION."



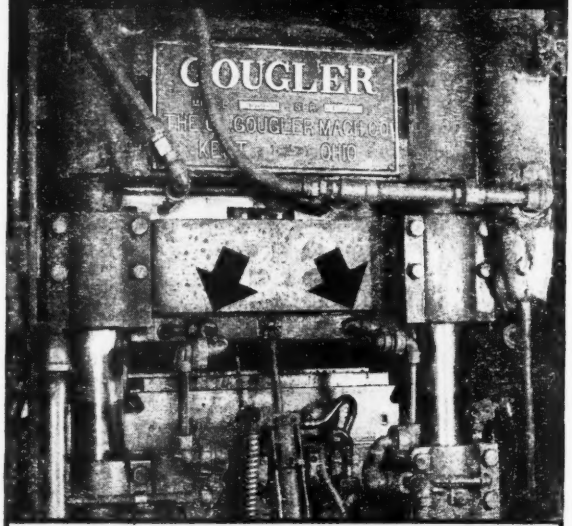
TWO important features give Barco Swivel Joints capabilities not found in ordinary swivel joints:

SELF-ALIGNING—Provides a wide tolerance for pipe fitting and machine alignment. Saves endless hours installation time and permanently protects against binding and wear.

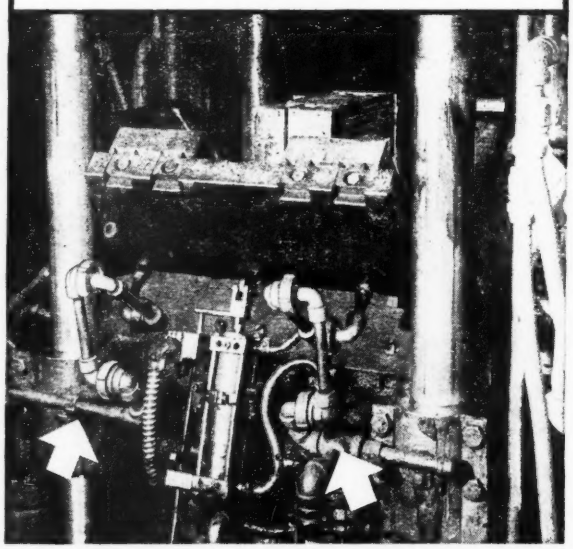
CHEMICALLY INERT SEAL—Pressure sealing and automatically self-adjusting for wear. Ideal for steam service. Uniform performance over temperature range from −50° to 450°. No lubrication needed.

Send for Catalog 265B, "Barco Self-Aligning Swivel Joints." Sizes ¼" to 2"; angle or straight. *Ask for recommendations—Barco is at your service.*

On Battery Box Molding Presses



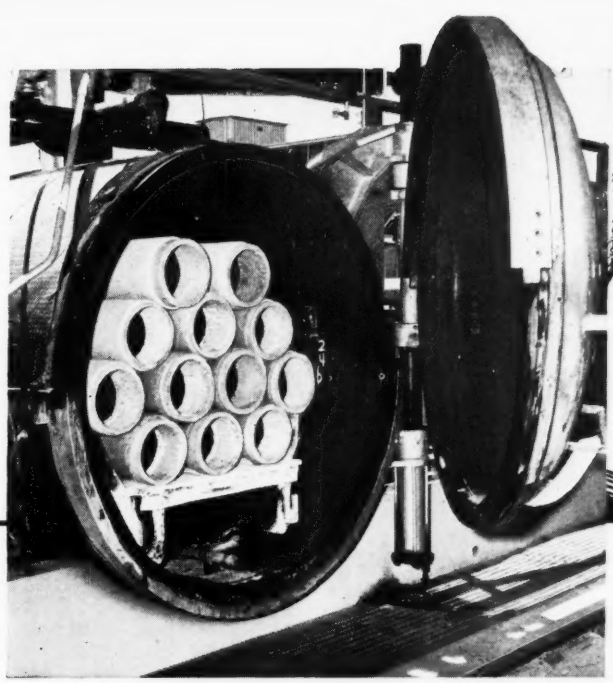
The arrows point to Barco Swivel Joints (in dog leg piping connections) as now used on presses of the Battery Box Division of The Electric Auto-Lite Company at Niagara Falls, N. Y. Approximately 1200 Barco joints are installed here. The presses use 135 psi steam and make 50 cycles per 8 hour shift. *(Upper photo)* Press closed. *(Lower photo)* Press open.



FOUNDED 1908
BARCO
PRODUCTS BACKED BY EXPERIENCE

BARCO MANUFACTURING CO.
5101 Hough Street • Barrington, Illinois

The Only Truly Complete Line of Flexible Ball, Swivel, Swing and Revolving Joints
In Canada: The Holden Co., Ltd., Montreal

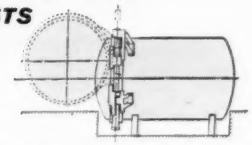


Memo to Production Engineers

◀ Adamson 90" dia. Hi-Lift Swing Door installed at Johns-Manville Products Corporation, Manville, N. J. One of many Adamson doors now in operation, or on order, for use in steam-curing TRANSITE® Pipe at J-M Plants in the U. S. and Canada.

Here are 6 important reasons why you should specify ADAMSON UNITED Hi-Lift Swing Vulcanizer & Autoclave Doors

1 LOWER INSTALLATION AND OPERATING COSTS



Adamson's lift-swing feature eliminates need for extended pit and expensive bridging. For example, on a 90" dia. door you can use an easily-handled loading bridge as short as 22".

2 TIGHT, LEAKPROOF SEAL

Adamson's special heat-resistant, self-sealing gasket utilizes vessel's internal pressure to assure a positive, leakproof seal.

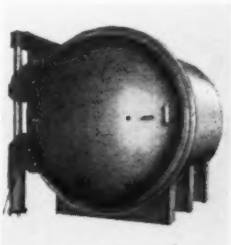
3 EFFICIENT SLIDE-LOCK DESIGN

Provides virtually 360° of locking surface between door and mating shell ring. *Twice* the locking area of conventional breech-lock doors!

4 SAFE, RELIABLE OPERATION

Equipped with automatic door locking pins. Can be furnished with optional steam interlock controls for complete safety. Other built-in safety features included.

5 STRONGER CONSTRUCTION



Conventional castings are replaced by sturdy pressed steel head welded to continuous roll forged locking rings.

6 FAST OPENING AND CLOSING

Quick-unlocking, vertical-lift action powered by hydraulic cylinder. Door swings easily on anti-friction and bronze sleeve bearings. Simple, trouble-free operation.

7067

ADAMSON UNITED

COMPANY

730 CARROLL STREET, AKRON 4, OHIO

Subsidiary of United Engineering and Foundry Company

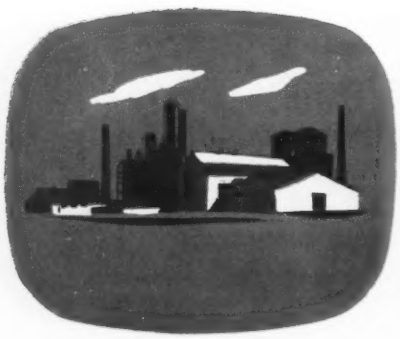
Plants at Pittsburgh, Vandergrift, Wilmington, Youngstown, Canton

We offer a wide range of door sizes and pressures, available as integral equipment on vessels supplied by us, or as separate units for mounting on tanks made by other manufacturers. Write for catalog No. 562.

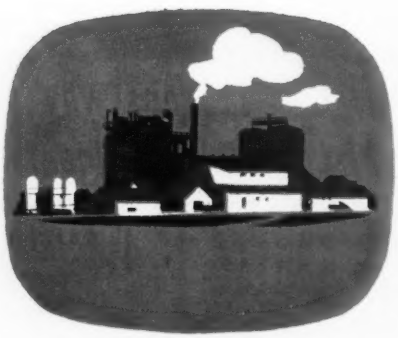
DESIGNERS AND BUILDERS OF BASIC MACHINERY AND EQUIPMENT FOR COMPLETE PROCESSES

WITCO-CONTINENTAL

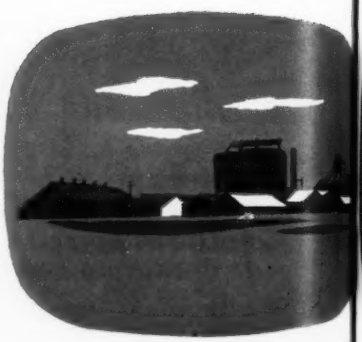
points the way...
to serve you
carbon black requirements



Ponca City, Oklahoma



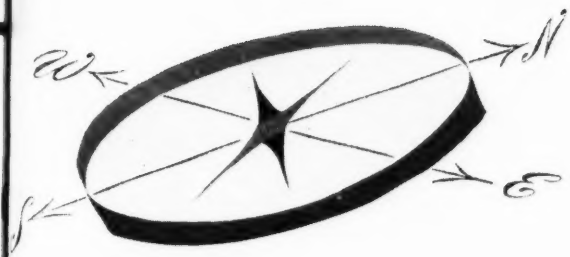
Westlake, Louisiana



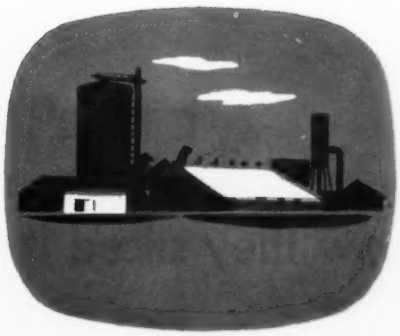
Eunice, New Mexico

... producing Continex® SRF, SRF-NS, HMF, HA...
FEF, ISAF, CF

Continental® AA, A, F, R-40
rubber black

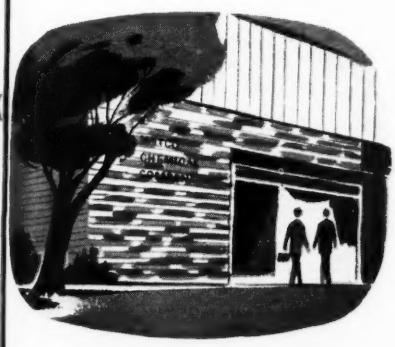


Sunray, Texas



Witco, Texas

. . . to solve your rubber problems



Research and Technical Service
Laboratories at
Amarillo, Texas and Akron, Ohio

Technical assistance has always played an important part in Witco-Continental's service to the rubber industry. To provide the utmost in promptness and efficiency, we maintain complete, modern research and technical service facilities. At our Akron laboratory, experienced rubber chemists are available to assist in solving customers' problems relating to carbon black and rubber formulations. At our modern research laboratory in Amarillo, new types of blacks are constantly being developed to help the rubber industries meet demands for new and improved products.

For prompt service in your area, contact your nearest Witco sales office.

WITCO CHEMICAL COMPANY
CONTINENTAL CARBON COMPANY

122 East 42nd Street, New York 17, N. Y.

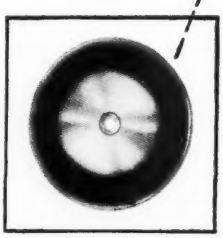
Chicago • Boston • Akron • Atlanta • Houston • Los Angeles
San Francisco • London and Manchester, England

No matter how they sliced it, RUBBER dulled their SKIVING KNIVES

The skiving knives used by a rubber processor had a short service life because rubber is highly abrasive. The disk-shaped blades had to be re-sharpened after each working shift, resulting in costly down time.

By Flame-Plating the knives on one side with tungsten carbide, their service life was increased 15-fold. Also, the knives gained the advantage of a self-sharpening effect: as the uncoated steel side wears more rapidly than the coated side, a sharp edge is always presented to the material being cut.

Flame-Plating is LINDE's special process for coating metals with a very hard and durable surface. By this method, tiny particles of tungsten carbide or aluminum oxide are literally *blasted* onto almost any metal surface. Most important, the temperature of the part seldom exceeds 400-degrees F., so there is little or no chance of changes in the shape or metallurgical properties of the part being coated. Flame-Plated coatings can be applied from .010 to .002 inches thick, and finished to 0.5 microinches rms.



The machinery and equipment you use to fabricate rubber can have its service life greatly extended at critical points of wear by Flame-Plating. For more information, write for a free copy of the booklet, "Flame-Plating," F8065. Address Flame-Plating Dept., LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. *In Canada:* Linde Company, Division of Union Carbide Canada Limited.

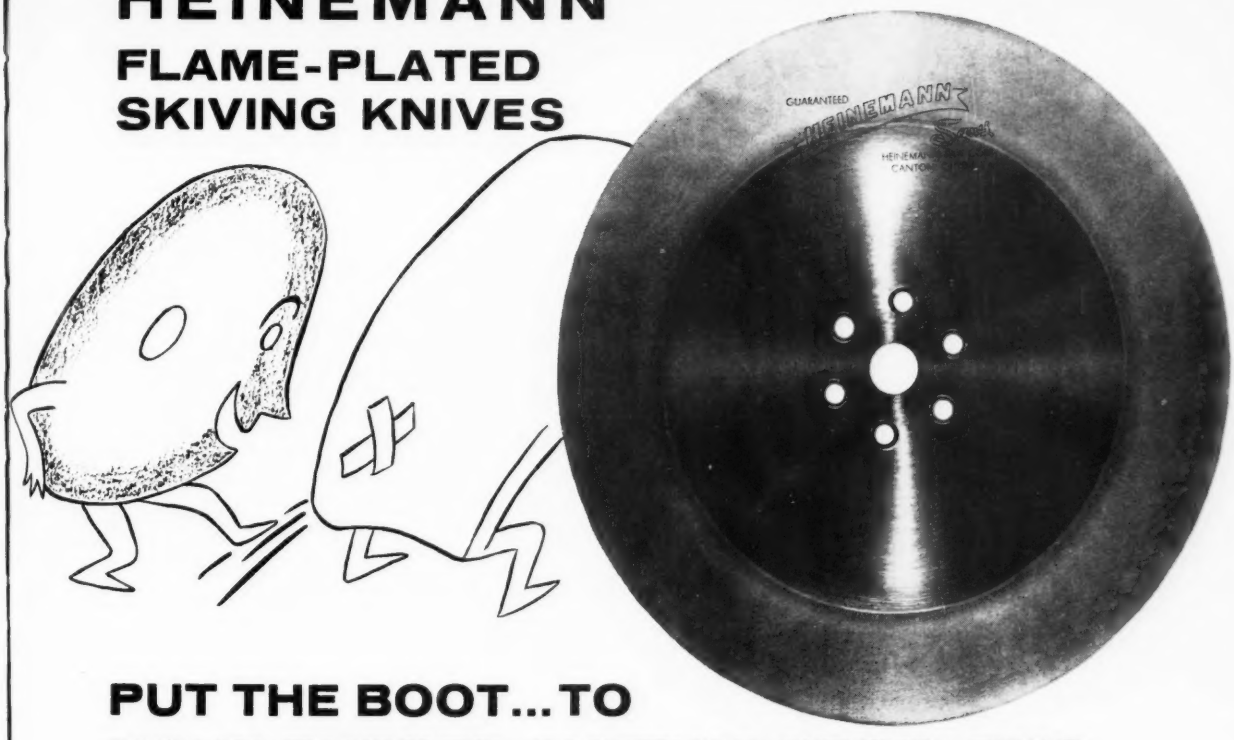
Linde

TRADE-MARK

The terms "Linde" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

UNION CARBIDE

HEINEMANN
FLAME-PLATED SKIVING KNIVES



PUT THE BOOT... TO YOUR RUBBER CUTTING PROBLEMS

Heinemann Flame Plated Skiving Knives plated one side with a coating of tungsten carbide by the special Linde Process have an expected service life approximately 15 or more times that of ordinary unplated skiving knives. In addition to increased service life advantage, Heinemann knives, flame-plated by the Linde Process, also have a self sharpening effect. As the softer steel base wears more rapidly than the hard tungsten carbide coating, a sharp edge always remains on the blade.

Heinemann manufactures skiving knives for cutting rubber, leather, cork, etc., in sizes from 5" to 24" diameters, and with various bevels and thicknesses.

For more information on this or any other Knife or Sawing Problem, write Heinemann Saw Corp., Canton, Ohio.

FOR MORE INFORMATION

NAME _____

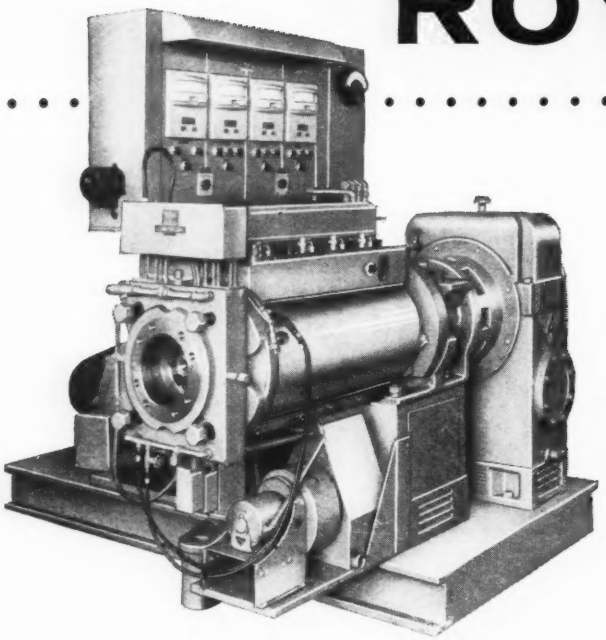
FIRM _____

ADDRESS _____

HEINEMANN SAW CORP. • CANTON, OHIO

ROYLE

SPIROD® EXTRUDERS



These all electric extruders with radiant heat and high velocity evaporative cooling are designed to process either plastic or rubber compounds. The result of more than three quarters of a century of experience — Royle pioneered the extrusion process in 1880— in the design and construction of extruding machines time tested features have been built into Spirod to assure dependability.

Write for Bulletin #463

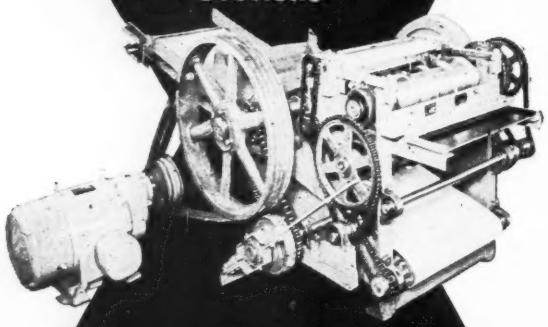
JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England	Home Office	Akron, Ohio	Los Angeles, Cal.	Tokyo, Japan
James Day (Machinery) Ltd.	V. M. Hovey J. W. VanRiper	J. C. Clinefelter	H. M. Royal, Inc.	Okura Trading Co., Ltd.
Hyde Park 2430 - 0456	SHerwood 2-8262	BLackstone 3-9222	LUdlow 9-3261	(56) 2130 - 2149

CUT YOUR RUBBER SHEETS into Exact Sections



with a

TAYLOR-STILES RUBBER CUTTER!

By using this Taylor-Stiles Rubber Cutter your sections will be exactly uniform in shape and size. In actual plant operations manufacturers have found that their sections were uniform to within 1/8 ounce.

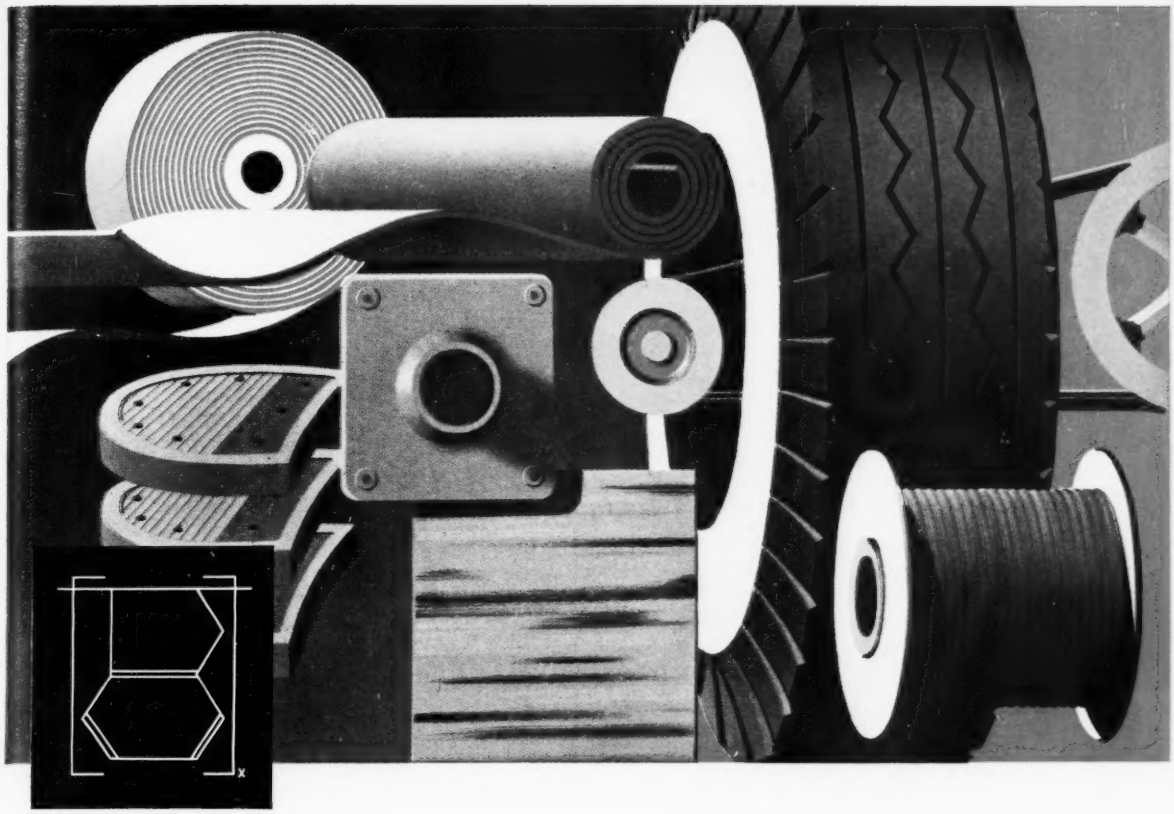
Production is high. In one instance a Taylor-Stiles Rubber Cutter cut 6 foot x 2 foot sheets into 5" wide strips and then cross cut these strips into 5" squares at the rate of 4648 squares per minute.

Taylor-Stiles Cutters are also used for pelletizing and cutting for latex.

Write for folder today.

TAYLOR, STILES & COMPANY

16 Bridge Street, Riegelsville, N. J.



Raise Quality and Lower Costs With Neville Coumarone-Indene Resins

Coumarone-indene resins by Neville have become standard in the processing of rubber for an ever-increasing variety of products in ever-greater volume throughout the years. Here's why. Users find that Neville gives them constant good quality and fast service, and they save production time and costs and produce better products when they use coumarone resins. Also, Neville has a broad variety of these ideal extender-plasticizers in various grades and melting points to suit every product need. Our chemists will gladly assist yours in selecting the proper one for your purpose. Use the coupon to write for further information.

Neville Chemical Company, Pittsburgh 25, Pa.

Resins—Coumarone-Indene, Heat Reactive, Phenol Modified Coumarone-Indene, Petroleum, Alkylated Phenol • **Oils**—Shingle Stain, Neutral, Plasticizing, Rubber Reclaiming • **Solvents**—2-50 W Hi-Flash, Wire Enamel Thinners.

NEVILLE

Please send information on Neville Chemicals.

NAME TITLE

COMPANY

ADDRESS

CITY NC 3-RW STATE

VULCANIZED VEGETABLE OILS

rubber substitutes

THE CARTER BELL MFG. CO.
SINCE
CARTER BELL PRODUCTS
1903
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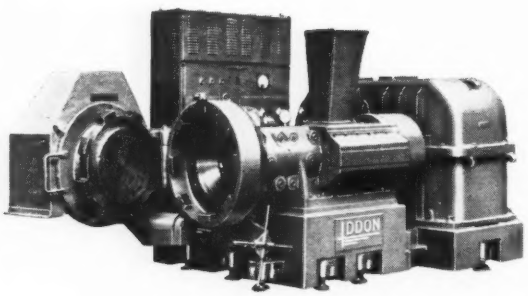

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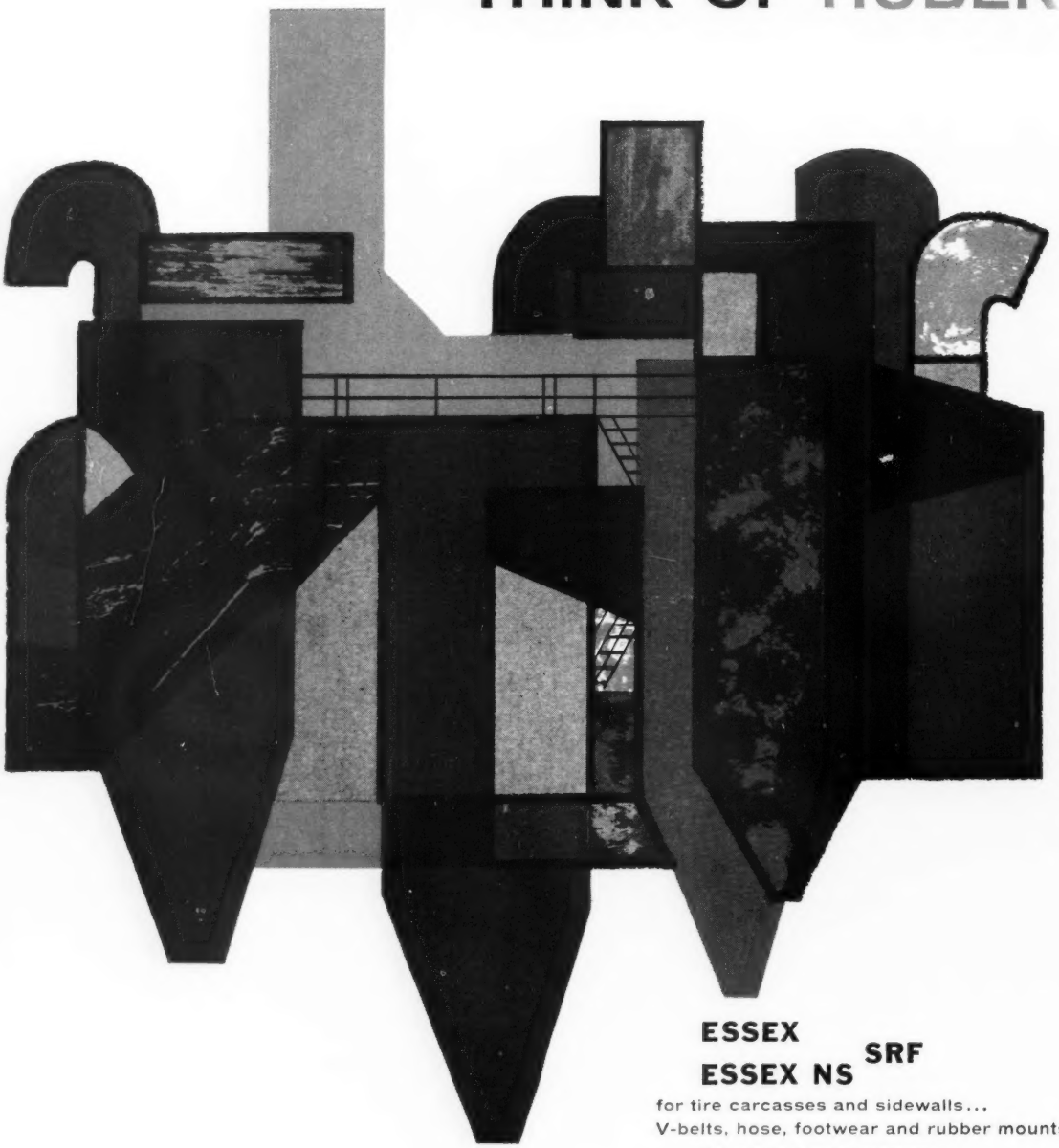

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RUBBER WORLD

EDITORIAL

OCTOBER, 1957

Shortage of Natural Rubber Could Become Serious

THERE is evidence of a growing new concern about the world and national supply-demand situation for natural rubber during the next five to ten years. World new rubber demand is expected to rise from 3.1 million tons this year to 3.5 million tons in 1960 and more than four million tons in 1965. Although world new rubber supply by 1960 has been estimated at 0.5-million ton in excess of demand, this excess is all *synthetic* rubber.

Synthetic rubbers are adequate for about two-thirds of rubber product needs, at least in this country. If world new rubber consumption continues to increase at the indicated rate while natural rubber production remains static at 1.9 million tons during the next 10 years, the United States may not be able to obtain its essential natural rubber supplies.

R. P. Dinsmore, vice president, Goodyear Tire & Rubber Co., apparently had some of these facts in mind when he said in a recent talk that the approaching critical supply situation on natural rubber and the urgency of developing as soon as possible a substitute or a rubber which will extend the natural supply, is a most important consideration. Dr. Dinsmore was addressing the Societe de Chimie Industrielle, an international organization of industrial chemists, in Athens, Greece. He predicted that starting in 1960, there will be a considerable shortage of natural rubber, and that this shortage will become more acute.

An examination of recently revised statistics published by the Secretariat of the International Rubber Study Group indicates that the actual production-consumption figures for 1956 showed a deficit of 17,500 tons and, for the first half of 1957, this deficit amounts to about 80,000 tons. *This is the first time in ten years that such a production-consumption unbalance has been recorded.*

Synthetic natural rubber or synthetic polyisoprene duplicates the structure and performance of natural rubber closely enough to compete in quality characteristics, but further time will be required to develop production processes that are economical and capable of accurate control.

Dr. Dinsmore stated his belief that a partial solution on time would be better than a complete solution late. Such a complete solution might be a rubber not adequate by itself, but one which could be used to extend natural rubber to a sufficient degree to permit time needed for development of a good substitute.

Plants for the production of synthetic polyisoprene on a volume basis cost about $500 a ton to construct, as compared with the $250 a ton cost for styrene-butadiene rubber plants. It was suggested in this column in January, 1956, that if the government in this country would contract to purchase a sizable tonnage of synthetic polyisoprene for the strategic stockpile at a price sufficient to permit producers to expand their production facilities at a more rapid rate than they might normally do, the time to develop complete self-sufficiency in rubber in this country would be considerably reduced.

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Radiation Effects In Elastomeric Vulcanizates[1]

By B. L. JOHNSON, H. E. ADAMS, and MARIE BARZAN

Firestone Tire & Rubber Co., Akron, O.

The effects of gamma radiation on the physical properties of tread-type vulcanizates of natural and synthetic rubbers have been evaluated by standard test methods over a temperature range from 73 to 500° F.

Natural rubber is indicated to be the best for usage as a general-purpose elastomer in compounds exposed to gamma radiation, particularly for products which must withstand flexure.

These data indicate that the cross-linking of natural rubber compounds by nuclear radiation may prove to be of value in the development of heat-resistant elastomeric products having good flexing characteristics.

THE recent growth in the number of applications of atomic energy to civilian and military purposes has increased the importance of studies on the effect of nuclear radiations on polymers. Numerous reports have been made which serve as a background for such a study. These papers have stressed the influence of polymer structure on reactions occurring during irradiation as well as the beneficial effects of radiation on polymers and have also provided a good evaluation of the radiation resistance of many polymers (1-5).[2]

There still exists a need to develop elastomers which are resistant to both radiation and high temperatures. Therefore the physical properties of gamma irradiated, tread-type vulcanizates have been evaluated by standard test methods over a temperature range of from 73 to 500° F. The cross-linking which occurs in an uncured compound or in a vulcanizate during irradiation has also been compared with that which occurs during a press cure in an effort to correlate the amounts of the two types of cross-linking with physical properties.

Irradiation Method

The natural rubber-based compounds investigated were typical tread-type compounds containing 50 parts of high abrasion furnace (HAF) black per hundred polymer. The synthetic polymers were reinforced to optimum properties either with 50 parts HAF black or with the material most suited to each polymer

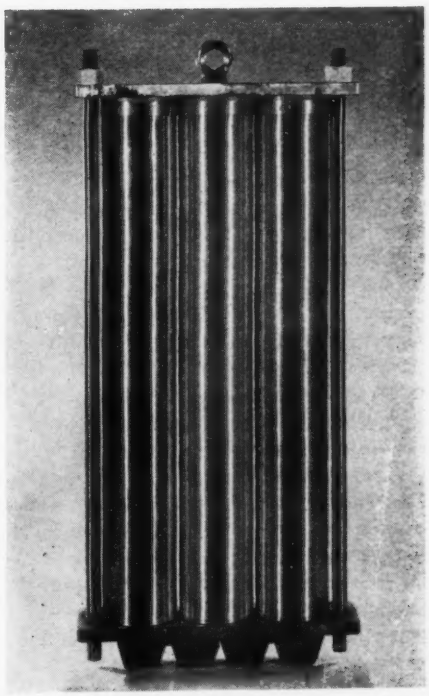


Fig. 1. Aluminum cans in which samples were held during irradiation experiments

[1]Presented before the Joint Conference of the Divisions of Rubber Chemistry, ACS-CIC, Montreal, P.Q., Canada, May 16, 1957.

[2]Numbers in parentheses refer to bibliography items at end of this article.

TABLE 1. EFFECT OF RADIATION ON REINFORCED VULCANIZATES

	Tensile Strength, Psi.		Flex Life, Hrs.	
Radiation Dose	None	5×10^7 Roentgens	None	5×10^7 Roentgens
Natural rubber	4300	3450	12.5	10.75
Styrene-butadiene rubber (FR-S 1500)*	3350	2875	11.0	1.5
Neoprene, G-18†	3650	3450	12.0	0
Acrylon EA-5	2350	2675	15.0	0
Silastic 401‡	675	575	58.0	0
Hypalon, S-2§	1900	2600	3.9	0
Butyl,** M-25††	2150	Soft	—	—
Polyurethane‡‡	5575	2475	—	—

*Firestone Tire & Rubber Co., Synthetic Rubber Division, Akron, O.
†50 parts EPC black.
‡40 parts Hi-Sil 303.
§20 parts HAF black plus 30 parts MgO.
**Enjay Co., Inc., New York, N. Y.
††60 parts HAF black.
‡‡20 parts HAF black.

(Table 1). These compounds were cured in the form of six- by six- by 0.075-inch slabs. The slabs to be irradiated in the uncured state were molded to the same dimensions by pressing between Holland cloth for five minutes at 212° F. and cooling the mold before opening. These slabs were placed in water-tight aluminum cans three inches in diameter and 20 inches long. The irradiation was done in air at atmospheric pressure. A lead weighted, aluminum framework, shown in Figure 1, was constructed to hold three cans during irradiation.

The irradiation of the polymers was done at the Materials Testing Reactor (MTR), gamma facility, of the National Reactor Testing Station near Idaho Falls, Idaho. This facility has been described in a monograph by Brewer F. Boardman (6). The gamma sources consist of spent MTR fuel elements immersed in a water shield. The elements are arranged to give a uniform gamma ray field above and inside the submerged fuel element assembly. The gamma fluxes from this source have been determined by chemical dosimeters (7) consisting of ceric sulfate solutions. The reduction of ceric to cerous ions has been correlated with the gamma intensity in roentgens[3] per hour (8).

Flux rates of about 3.8 and 7.8 x 10^6 roentgens per hour were used during irradiation of the polymer vulcanizates of this study. The samples were allowed to remain in the field at the indicated average flux rate for sufficient time to obtain the desired total dosage.

A check on the dosage received by each individual sample was obtained by measurement of the fading, caused by the radiation, of a cellophane film dyed with a blue, dimethoxydiphenyl-bisazobis-8-amino-1 naphthol-5,7 disulphonic acid dye (9). Strips of the blue cellophane were placed in the aluminum cans along with the polymer samples. After irradiation, the change in light transmission was measured with a Beckman spectrophotometer. The dosages actually received by the samples were indicated to be in agreement with those calculated from the known flux rate of the gamma facility.

TABLE 2. SOLUTION PROPERTIES OF IRRADIATED RAW POLYMER

Radiation Dose	None	5×10^6r	10×10^6r	50×10^6r
		Gel Content*		
Natural Rubber	0	87.3	90.3	93.8
Styrene-butadiene rubber (FR-S-1500)	0	27.9	32.0	86.8
Neoprene, G-18	0.4	61.7	76.6	94.2
Butyl, M-25	0	0	0	0
		Inherent Viscosity†		
Natural Rubber	4.2	2.0	2.1	2.8
Styrene-butadiene rubber (FR-S-1500)	2.1	1.9	1.5	1.1
Neoprene, G-18	1.5	0.6	—	—
Butyl, M-25	1.1	0.5	0.5	0.2

*Gel = portion of polymer insoluble after 48 hours in toluene as measured by static solubility test of 0.4-gram polymer in 100 millilites of toluene. Polymers become insoluble as cross-linking (or cure) progresses.
†Inherent viscosity = viscosity of dilute solution filtrate from gel determination. For terminology see L. H. Cragg, *J. Colloid Sci.*, 1, 261 (1946). For complete details of method see B. L. Johnson, *Ind. Eng. Chem.*, 40, 351 (1948). The rapid decrease in viscosity of butyl rubber is indicative of an extreme degree of degradation.

Evaluation of Irradiated Polymers

The general effect of gamma radiation on polymers is to cause either cross-linking or scission of the polymer chain. Polymers have been separated into groups which react in one or the other of these two ways both on the basis of heats of polymerization (10) and on their molecular structure (2, 11). Since the changes in physical properties are largely dependent on whether cross-linking or degradation predominates, we have used the cross-linking level to study some of the effects of radiation on the properties of natural rubber vulcanizates.

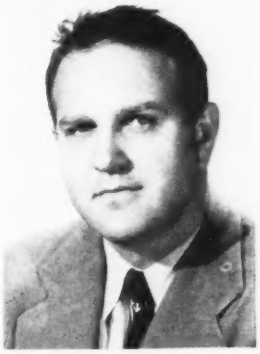
This tendency toward either cross-linking or degradation in some of the common elastomers is illustrated by the change in tensile strength and flex life upon irradiation. For instance, all but the last two polymers listed in Table 1 cross-link upon irradiation. Even though cross-linking takes place, tensile strength may either decrease, as does that of natural rubber and styrene-butadiene copolymer (SBR); remain about the same, exemplified by neoprene and silicone rubber (Silastic 401);[4] or actually increase as does that of acrylic-acrylonitrile rubber (Acrylon EA-5)[5] or chlorosulfonated polyethylene (Hypalon).[6] Polyurethane and butyl rubber afford examples of polymers which undergo chain scission; the butyl vulcanizate becomes too soft to test.

Since a general-purpose polymer, liable to exposure to radiation, should withstand flexure as well as radiation, flex life is an important criterion of its usefulness after irradiation. This property was measured on standard dumbbell strips of 0.100-inch gage flexed from 0 to 75% elongation (12). Since there was no cracking in the natural rubber vulcanizate before rupture, the

[3]Roentgen—that quantity of radiation that will produce one electro static unit quantity of electricity of either sign in one cubic centimeter of dry air at 0° C. and 760 millimeters of Hg.
[4]Dow Corning Corp., Midland, Mich.
[5]American Monomer Corp., Leominster, Mass.
[6]E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

B. L. Johnson

Miss M. L. Barzan



H. E. Adams

The Authors

B. L. Johnson, group leader, special rubbers division, chemical and physical research laboratories, Firestone Tire & Rubber Co., received his B.S. degree in 1928 from Purdue University, his M.S. from the University of Illinois in 1931, and his Ph.D. from University of North Carolina in 1933. He was a member of the student training class at Firestone from 1928 until 1930.

After he obtained his Ph.D. in 1933, he returned to Firestone as chief chemist of the Xylos Rubber Co., reclaiming division.

Dr. Johnson is a member of the American Chemical Society and its Rubber Chemistry and Polymer Divisions and is a past secretary and member of the council of the local Akron section.

H. E. Adams, research chemist with Firestone, obtained his B.S. degree from Dickinson College in 1938, his M.S. from Lafayette College in 1939, and his Ph.D. from Massachusetts Institute of Technology in 1942.

He was employed by the Armstrong Cork Co. as a research chemist from 1942 until 1948 when he joined Firestone.

Dr. Adams is a member of the American Chemical Society and its Rubber Division.

Marie L. Barzan received her B.S. degree from Kent State University in 1947 and has studied rubber and polymer chemistry at the University of Akron.

Miss Barzan was employed as a chemist by The B. F. Goodrich Co. in 1947, in 1947-48 was a science teacher in the Columbiana County Ohio school system, and joined Firestone in 1948, where she is now a research chemist in the special rubbers division.

She is a member of the American Chemical Society and has been active in Akron local section activities and was formerly on the staff of Akron Technical Topics, a technical journal for the Akron area.

average flexing time required to break the strips was recorded as the flex life.

Although natural rubber cross-links upon irradiation, it retains its flexibility at radiation levels where many of the other common elastomers have become brittle or, like butyl vulcanizates, have undergone chain scission and become too soft to test (Table 1). Styrene-butadiene copolymers cross-link less rapidly than some of the other synthetic elastomers because of the protection against radiation afforded by the aromatic nature of the styrene. These differences in cross-linking are also evident in the rates of gel formation or in the inherent viscosity of toluene solutions of the irradiated raw polymers (Table 2). Natural rubber, SBR, and neoprene all cross-link at different rates; while butyl rubber degrades quite rapidly.

The vulcanizates of the synthetic polymers are known to be somewhat more resistant to oven aging at 212° F. than are those of natural rubber. This point is also true for irradiated vulcanizates (Table 3). Unfortunately those polymers whose irradiated vulcanizates age better, neoprene and acrylonitrile-butadiene copolymer for example, decrease excessively in ultimate elongation and flexibility at the higher levels of irradiation. Therefore studies on the utilization of radiation to improve elastomer properties at high temperature were made on tread-type vulcanizates of natural rubber.

Stress-Strain Properties at Elevated Temperature

Rubber vulcanizates may, in the future, encounter service requirements of high-temperature operation in the presence of atomic radiation. Since vulcanization by conventional means offers the most immediate and economical method of obtaining rubber products, ordinary tread-type vulcanizates cured with sulfur were the first to be investigated. Stress-strain properties were measured at various temperatures by using the apparatus described by Lavery and coworkers (13).

At a test temperature of 400° F. the tensile strength

TABLE 3. AGED TENSILE STRENGTH OF GAMMA IRRADIATED VULCANIZATES(*)

Air Oven—Two Days at 212° F.

Polymer	Natural Rubber		Styrene-Butadiene		Neoprene		Acrylonitrile-Butadiene	
Radiation Dose	Tensile (Psi.)	Elong. %	Tensile (Psi.)	Elong. %	Tensile (Psi.)	Elong. %	Tensile (Psi.)	Elong. %
None	2625	370	2700	230	3450	390	4100	310
5 x 10^6r	2775	380	2800	220	3425	360	3950	280
10 x 10^6r	2675	370	2875	220	3275	310	3900	240
50 x 10^6r	2375	280	2700	190	2625	130	3900	170

*Neoprene cured 20 minutes at 280° F.; all others 30 minutes at 280° F.

of natural rubber tread vulcanizate increases from a value of 330 psi. in the non-irradiated sample to a maximum of 690 psi. in the material irradiated at 5 x 10^7 roentgens. The ultimate elongation is retained fairly well except at the extreme dosage (Table 4).

At the lower test temperatures of 73, 212, and 275° F. the opposite trend of tensile strength, that of a regular decrease in strength as the irradiation level is increased, was observed. The data of Table 4 at 73° F. are typical of this effect. As a result, vulcanizates irradiated to the 5 x 10^7 roentgen level necessary to obtain maximum tensile strength at 400° F. have much lower strengths than the non-irradiated vulcanizates at these intermediate test temperatures. This causes an interesting reversal (illustrated in Figure 2) in tensile strength behavior of the irradiated vulcanizate when compared to that of the non-irradiated vulcanizate. Although the curve for tensile strength of the irradiated polymer as a function of test temperature lies below that of the non-irradiated vulcanizate at temperatures of 275° F. and below, it is definitely higher at 400° F. and above.

It is believed that the explanation of this tensile behavior lies in the type of cross-link and amount of radiation induced cross-linking. A high level of thermally stable carbon to carbon cross-links is necessary for good retention of properties at 400° F.

Yet it is known that excessive cross-linking will reduce tensile strength at room temperature by a reduction of crystallinity. Some confirmation of the belief that the loss of tensile strength at the lower test temperature is caused by reduced crystallinity is obtainable from the fact that the tensile strength-temperature relation for the non-crystalline styrene-butadiene copolymer, whether irradiated or not, closely parallels that for the irradiated natural rubber vulcanizate for which we have assumed a decreased crystallinity caused by radiation induced cross-linking. Therefore an experimental measurement of this level of radiation induced cross-linking was thought to be of value in explanation of the behavior of irradiated vulcanizates over a temperature range.

TABLE 4. EFFECT OF RADIATION ON STRESS-STRAIN PROPERTIES OF NATURAL RUBBER VULCANIZATES AT ELEVATED TEMPERATURE

Radiation Dose, r	None	5 x 10^6	1 x 10^7	5 x 10^7	1 x 10^8
73° F.					
Tensile strength (psi.)	4250	3900	3850	3540	2825
Elongation, %	520	540	510	430	260
400° F.					
Tensile strength (psi.)	330	460	580	690	510
Elongation, %	460	500	480	300	150

Cross-Linking

Experimental data on this increase in cross-linking as a function of radiation dose have been obtained by the equilibrium swelling technique (14). Three facts are evident from such data plotted in Figure 3.

First, the rate of cross-linking is a linear function of the gamma ray energy supplied to the sample either in the uncured state or if vulcanized to optimum properties. Second, a cross-linking level comparable to that of a conventional press cure can be obtained by radiation alone. Finally, cross-links can be superimposed upon the cross-linking level obtained in the thermal, press cure to obtain a very high level of cross-linking.

It is this high level of cross-linking of the cured vulcanizate in which we are interested for an explana-

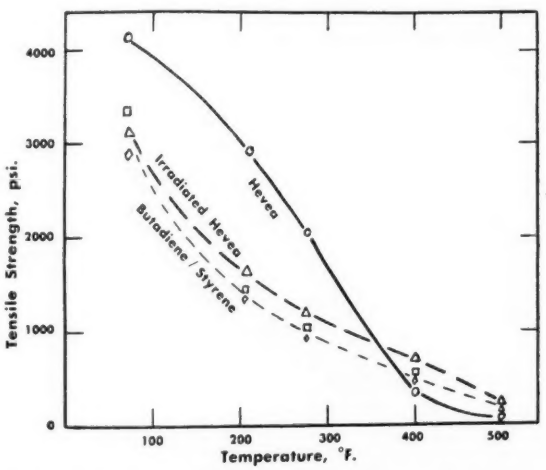


Fig. 2. Tensile strength of irradiated vulcanizates as a function of test temperature

TABLE 5. STRESS STRAIN PROPERTIES OF TREAD COMPOUND THERMAL *VS.* GAMMA RADIATION CURE

Thermal Cure @ 280° F., Min.	Modulus@ 300%, Psi.	Tensile Strength, Psi.	Elongation, %
8	375	1050	490
15	1575	3625	540
30	2200	4200	520
60	2475	4000	450
120	2575	3975	430
Radiation Cure, Roentgens			
1×10^7	800	1900	500
5×10^7	1600	2850	480
1×10^8	2150	2700	400

TABLE 6. CROSS-LINKED UNITS *VS.* TEST TEMPERATURE

	Moles Cross-Linked Units x 10^4 G. Rubber			
Test Temperature (°F.)	73	212	275	400
Control				
Before test	2.09	2.09	2.09	2.09
After test	2.13	2.02	2.11	0.81
Tensile (psi.)	4200	2600	1920	390
Irradiated 5×10^7 r				
Before test	3.51	3.51	3.51	3.51
After test	3.35	3.67	2.83	1.43
Tensile (psi.)	3625	2090	1580	690

tion of both the drop in its tensile strength at room temperature and the improvement in its tensile strength at elevated temperature.

Effect of Cross-Linking on Tensile Strength

The actual relation between this cross-linking level and the tensile strength of the press cure is compared in Figure 4 with that for the irradiated 30-minute press cure at 280° F. and with the compound cured by radiation alone.

There is a maximum in tensile strength as cross-linking progresses similar to that previously reported by Flory and coworkers (15) for natural rubber quantitatively cross-linked with decamethylene dismethyl azodicarboxylate. The solid curve represents a range of thermal cures of 8 to 120 minutes at 280° F. The maximum tensile strength is obtained at the 30-minute cure which contains about 2.0×10^{-4} moles of cross-linked units per gram rubber. As cross-linking is increased either by continued press cure or by irradiation, the tensile strength decreases rapidly.

A higher level of cross-linking, with a correspondingly larger drop in tensile strength, is obtained by irradiation of the 30-minute cure at 1, 5, and 10 $\times 10^7$ roentgens (upper dotted line, Figure 4). The maximum tensile strength is reached at a somewhat lower degree of cross-linking in the case of the radiation cure, and the ultimate tensile strength is about 1000 psi. lower than that of the press cure.

The complete normal stress-strain properties of the thermal and gamma radiation cured vulcanizates are compared in Table 5. It is possible that higher tensile strengths might have been obtained had the irradiation been done in a mold under pressure.

The data of Figure 4 have shown that the cross-linking level of the irradiated 30-minute vulcanizate is high enough that lower tensile strengths should be expected at moderate temperatures. In order to determine whether or not this increased carbon to carbon cross-linking was also responsible for the higher tensile strength at 400° F., the moles of cross-linked units per gram of rubber remaining after the six-minute preheat and tensile test were measured at each of four temperatures. The values recorded in Table 6 indicate that there is no decrease in the number of cross-linked units as a result of testing the non-irradiated control until a test temperature of 400° F. is reached. This is additional evidence that the decrease in tensile strength at these lower temperatures should be attributed to a

(Continued on page 83)

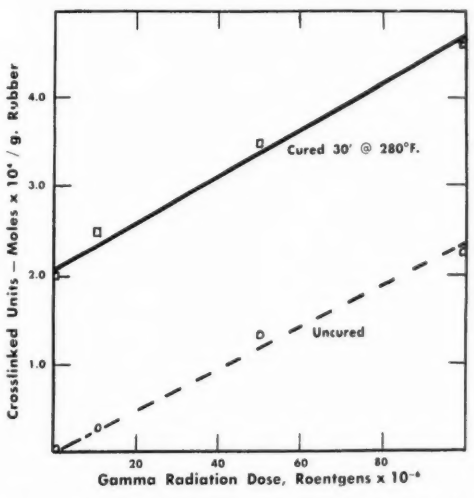


Fig. 3. Radiation induced cross-linking of both cured and uncured natural rubber tread compound

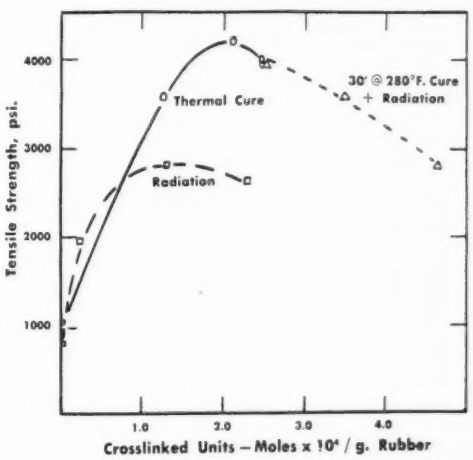


Fig. 4. Tensile strength as a function of cross-linking—thermal *vs.* radiation cure

A Constant Torque Abrasion Machine With a Permanent Abrasive Surface[1]

By IRA WILLIAMS
J. M. Huber Corp., Borger, Tex.

The Grasselli Du Pont abrader has been modified to provide variable speed and to operate at a constant torque. The abrasive service is a metal disk with silicon carbide sparsely bonded with modified epoxy resin and is easily duplicated to provide practically unchanged cutting power on most rubber compounds for six million revolutions.

While the machine is capable of reproducing results within 2% or 3%, it will not predict the service life of a compound. It appears to predict reliably, however, the relative performance of compounds using the same matrix.

MANY machines have been developed, and many ideas for measuring the abrasion resistance of rubber compounds have been investigated. A. E. Juve, J. H. Fielding, and F. L. Graves (1)[2] found that fat acids and softeners had a great influence on abrasion. S. D. Gehman, C. S. Wilkinson, Jr., and R. D. Daniels (2) provided an apparatus for measuring the smear tendency of rubber during abrasion. T. R. Griffith, E. B. Storey, J. W. O. Backley, and F. M. McGilvray (3) showed that extraction of the samples before testing appeared to give better results. R. G. Newton, J. R. Scott, and W. K. Willott (4) studied different abrasives and concluded that a standard abrasive can probably not be produced. Newton and Scott (5) studied a bonded abrasive wheel on the Du Pont machine and found that the cutting action continually decreased, J. M. Buist (6) found that abrasive papers rapidly lost their cutting power. Buist (7) from an analysis of wear curves derived an empirical formula to correct for the changing rate of wear as abrasion proceeds.

C. C. Baird and J. F. Svetlik (8) showed that the relative rate of wear varies with the severity of the test conditions. J. W. Adams, J. A. Reynolds, W. E. Messer, and L. H. Howland (9) used a modified Lambourn abrader lubricated with talc and found fair agreement between laboratory tests and performance. J. R. Scott (10) compared the machines of Akron Standard Mold Co. and E. I. du Pont de Nemours & Co., Inc., and found different abrasion indices with each. J. M. Buist (11) found that the Du Pont machine gave improved

[1]Presented before the Joint Conference, ACS-CIC Divisions of Rubber Chemistry, Montreal, P.Q., Canada, May 15, 1957.
[2]Numbers in parentheses indicate bibliography references at end of article.

The Author

Ira Williams, director of research, J. M. Huber Corp., attended Kansas University and Sterling College and received his B.A. degree from the latter in 1916. He did graduate work at the universities of Chicago, Pittsburgh, and Akron and secured his M.S. degree from Akron U in 1920. He won the first and second fellowships of Firestone Tire & Rubber Co. at Akron U and was employed in the Firestone research department from 1920 until 1924.

Then Ira Williams went to the Mellon Institute of Industrial Research for a study of rubber chemicals on a fellowship of the Grasselli Co., which he joined after completion of the study. When Grasselli was acquired by E. I. du Pont de Nemours & Co., Inc., in 1929, he was transferred to the Du Pont Jackson Laboratories, where he was involved primarily in work on rubber and rubber chemicals.

Dr. Williams joined Huber in 1938 and directs all research on clays, carbon blacks, and other inorganic and organic materials.

He was awarded the Goodyear Medal of the Division of Rubber Chemistry, ACS, in 1946 and has since been given an honorary D.Sc. degree from Akron U. He has also received the National Association of Manufacturers Award.

Ira Williams

results if operated at constant torque, and E. F. Powell and S. W. Gough (12) have modified the Lambourn machine to operate at constant power. Walter Viehmann (13) concludes that the power consumed during an abrasion test is almost entirely consumed to produce heat at the abrasion surface.

L. H. Howland, and W. W. White and W. E. Messer (14) studied the effect of loading, cure, coefficient of friction and temperature on results obtained with the Lambourn machine. Walter Kern (15) analyzed the wear on tires and concluded that other factors than the abrasion resistance of the rubber contributed to the rate of wear. G. Ebert and V. Weidner (16) studied the effect of rate of slip and type of abrasive and believe that abrasion tests can be reliable. A. Schallamach (17) has studied such factors as area of contact and influence of frictional factors from a theoretical viewpoint. No investigator claims to have found an abrasion test which will predict service life, and most investigators use abrasion tests only to compare one compound with another.

Description of Apparatus

The present apparatus was developed to provide greater control of such factors as speed, load, temperature and abrasive surface. The general principle employed is that of the Grasselli Du Pont abrader redesigned to use rotating cylindrical test pieces and to maintain automatically operation at any predetermined constant torque. The abrasive is a sparsely coated steel disk to which silicon carbide is bonded with a thermosetting plastic. The test pieces and abrasive are enclosed in a cabinet which provides temperature control and restrains the talc which is constantly brushed on to the abrasive surface.

The test pieces are cylindrical, one square inch in cross-section and ¾-inch long. The test pieces are held with an end against the abrasive and rotate on their axis at the same speed and in the same direction as the abrasive disk. Under these conditions the relative velocity between the abrasion disk and every part of the end surface of the test piece is equal. The abrasion is uniform over the entire end surface and takes place in every direction. The worn surfaces are flat, and the abrasion loss is determined by measuring the decrease in thickness of the test pieces.

The construction of the machine is shown in Figures 1, 2, and 3. Figure 1 shows the assembly which holds the test pieces. As in the Du Pont machine, the shaft which carries the rotating abrasion disk is hollow. Shaft A extends through the hollow shaft and is keyed to rotate with it, but is free to move endwise. The remainder of the assembly floats on ball bearings on shaft A. Both test-piece holders are chain driven from a sprocket attached to the shaft. B is the lever arm which keeps the assembly from rotating and which is used to measure torque. The pin C attached to the lever arm actuates an air bleed valve and maintains the machine in operation at any desired torque which is pre-determined by the weight suspended from the end of the lever arm.

Figure 2 shows the assembly in position. D is the air bleed valve which regulates the air pressure to maintain constant torque. E is a weight which determines the torque. F is a mechanism which feeds talc to a brush resting against the abrasive disk G. A variable transformer, used to control heaters in the enclosing cabinet is shown at H.

Figure 3 shows the variable-speed drive and the method of applying load to the test pieces. Air at a pressure of two pounds per square inch is supplied by a regulator. After passing a control valve J, it enters a cylinder and piston assembly, K. The piston presses against the lever L, which is connected through a swivel to the end of the shaft, A. An air connection extends from the cylinder to the air bleed valve D, which regulates the air pressure to maintain constant torque. The air pressure in the cylinder is measured by gage N.

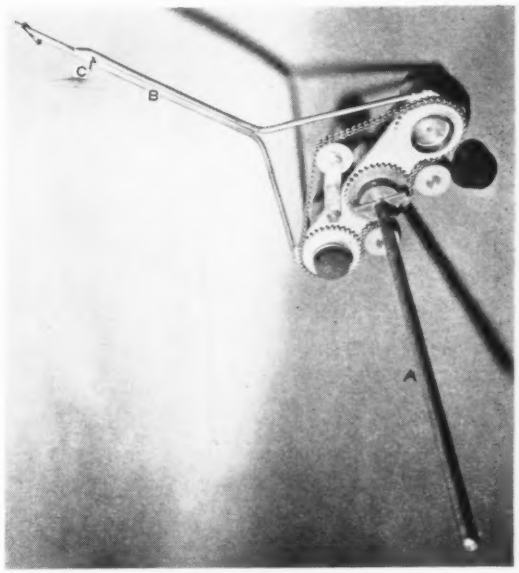


Fig. 1. Abrasion machine assembly with test pieces. A is shaft which extends through hollow shaft carrying abrasion disk. B is lever arm used to measure torque, and C is pin to actuate air bleed valve and maintain constant torque

The operation procedure follows. The drive motor is shifted to use that part of the step pulley which will give the desired speed. The speed ordinarily used for general testing of tread stock is 468 rpm. The machine is first warmed, either by abrading a set of test pieces or with the electric heaters, to the expected equilibrium temperature. The thicknesses of the test pieces are determined. The test pieces and assembly are placed in position and connected through the swivel to the loading mechanism, and the correct weight is hung on the end of the lever arm to give the desire torque. The machine is started, and air valve J is regulated to bring the lever arm midway between the lever restraining stops, M, of Figure 3, where it will remain for the duration of the test. After the required running period, the test pieces are removed, cooled, and measured.

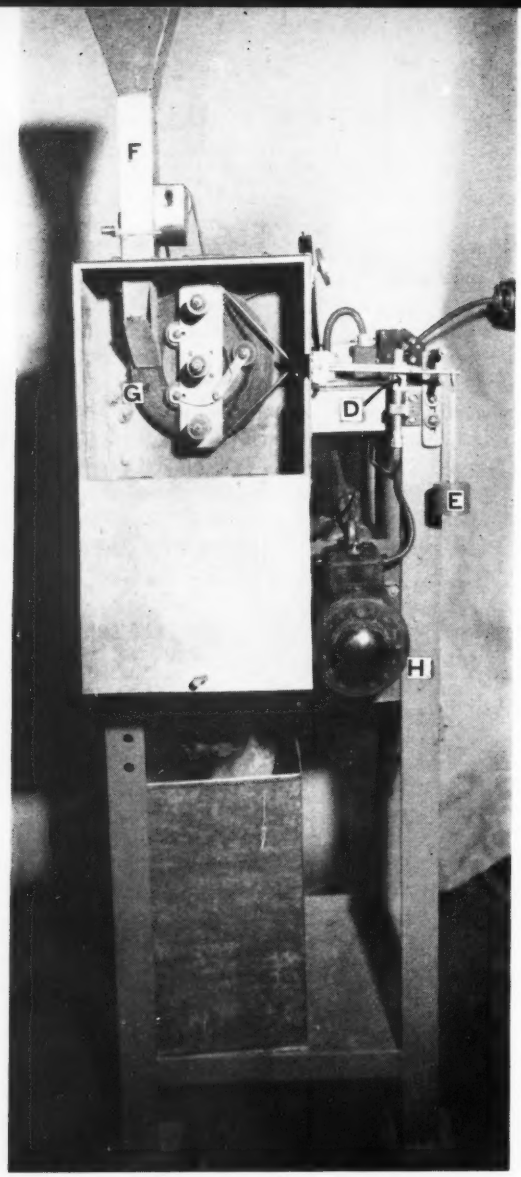


Fig. 2 Front view of machine with abrasion assembly in position. D is air bleed valve; E is a weight which determines the torque; F is a talc feeding mechanism; G is the abrasive disk; and H is a variable transformer used to control electric heaters in the enclosing cabinet

Abrasive Surface

The most important part of an abrasion machine is the abrasive surface which must not be too severe in its action on the rubber and must be constant in this action from one test to another. Also, it should be a surface which is easily cleaned and easily duplicated. None of the abrasive surfaces in common use meet all of these requirements.

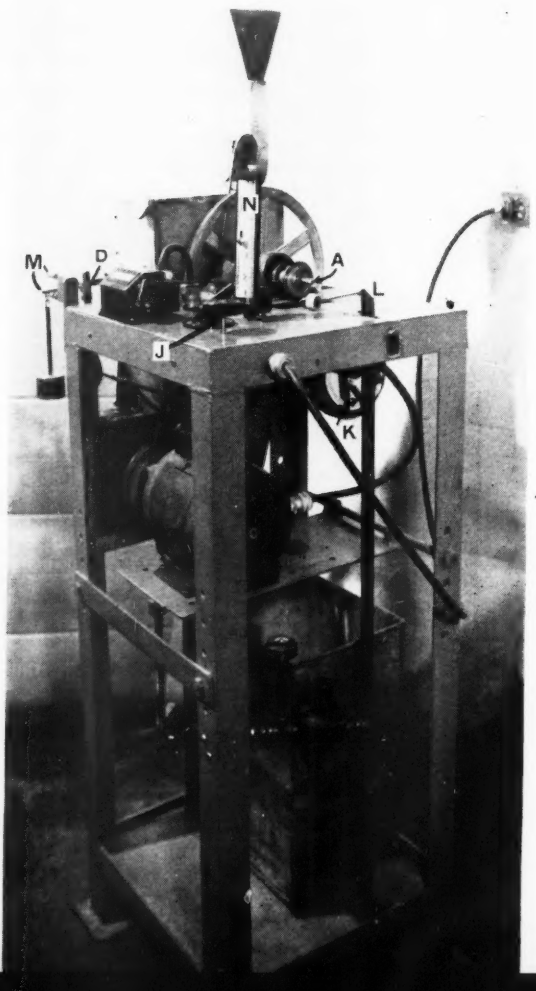
Surfaces in common use are of two types. The first are stones which are usually composed of bonded silicon carbide. The type of surface is characterized by a series of pits, with the top edges of the pits at a uniform level. Such surfaces are easily clogged in use, however, and the cutting rate decreases. The abrasion rate can be temporarily restored by cutting away the stone's surface.

The second common abrasive surface is coated paper or cloth. This type of surface is characterized by a series of hills and connecting valleys. If the abrasive particles are sufficiently large, such a surface does not clog badly in use. Extensive tests with abrasive papers have shown that clean surfaces can be maintained by brushing with talc, if the abrasive is sufficiently coarse. Paper coated with 150-micron particles (about 100 mesh Tyler) clogs badly, while paper coated with 250-micron particles (60 mesh Tyler) remains perfectly clean.

The abrasive surface finally selected consists of silicon carbide particles between 400 and 540 microns in size (pass 30 mesh, but are held on 40 mesh Tyler), applied to a flat steel disk in the amount of 0.004-gram per square centimeter, and bonded with 0.0206-gram per square centimeter of a phenolic modified epoxy resin.[3] In preparing the surface, the cleaned metal disk is laid on a level surface; an amount of the thin varnish solution which contains the required weight of resin is

[3] Lancote clear baking varnish, Type 1, 39% solution, J. P. Landau Co., Carlstadt, N. J.

Fig. 3. Rear view of machine showing drive mechanism and method of applying load to test pieces. J is air pressure control valve; K is cylinder and piston assembly; L is lever connected with piston and end of shaft A; D is same air bleed valve as in Figure 2, which regulates the air pressure to maintain constant torque. N is gage for measuring air pressure in cylinder K



quickly and evenly spread with a spatula, and the required weight of grit is evenly distributed from the end of a thin, rotating glass tube passed several times at a height of about five inches over the surface. Any noticeable clumps can be separated with a needle. After several hours' drying, the disk is laid flat in an oven and heated for an hour at 100° C. followed by four hours at 200° C. The particles or rubber removed by this disk vary in size between about 10 and 80 microns. A satisfactory disk, after several weeks use on tread rubber, is shown in Figure 4.

Disk Cutting Rate Uniformity

The rate of cutting of such disks can be closely duplicated. The abrasive grains sink through the thin varnish and rest on the metal disk which provides a substantial and uniform base. The same amount of resin buries the grains to the same depth. Since the grains are widely separated, they do not interfere with each other and tend to lie flat rather than rest with a long dimension vertical. Any deviation from a standard cutting rate is usually on the plus side and is due to allowing too much time between spreading the varnish and adding the abrasive which permits skin formation on the varnish and prevents the abrasive grains from sinking to the metal disk. Of 14 disks prepared and tested on a high-abrasion resistance, low-temperature polymer tread stock at one foot pound torque for 15,000 revolutions at 468 rpm., 11 caused losses between the limits of 0.386- and 0.402-inch. The remaining three, which varied between 0.437 and 0.472, were discarded.

The standard compound used for determining the cutting rate of the disk is as follows:

STANDARD COMPOUND

LTP SBR	100.0
High abrasion furnace black	50.0
Zinc oxide	5.0
Stearic acid	1.5
Sulfur	1.8
Santocure*	1.0
Circosol 2XH plasticizer†	7.5
Cure 60 min. @ 300° F.	

*Monsanto Chemical Co., Rubber Chemicals Department, Akron, O.
†Sun Oil Co., Philadelphia, Pa.

This compound with the present average quality of the above types of carbon black and rubbers, when tested at 468 rpm. for 15,000 revolutions at one foot pound torque, will show a combined loss from the two test pieces of 0.40 ± about 0.004-inch. Owing to the variability of both rubber and carbon black from one lot to another, and owing to the drift in quality of both materials over a period of years, a loss of 0.40-inch as such, cannot be used as a measure of the cutting rate of a standard disk. The standard compound serves only for selecting a set of disks which cut at a uniform rate. The disk then becomes the standard against which abrasion losses are determined.

Disks formed in this manner are reasonably permanent if used on resilient rubber, which may include such compounds as hard tread stocks and rubber heels. The abrasion rate for one disk was followed for a period of five-million revolutions. Tests spaced at intervals while the disk was in general use for testing assorted compounds showed losses for the standard compound when tested for 15,000 revolutions at 468 rpm., and one foot pound torque which varied between 0.387-and 0.403-inch. This range represents about the accuracy of repeat tests with the equipment: however, the abrasion disks can be dulled. Silicon carbide is hard but brittle.

Fig. 4. Silicon carbide bonded with epoxy resin solution abrasion disk surface

The testing of such material as tile stock, with a durometer hardness of 90 to 95, will immediately dull the disk, which appears to stabilize at a cutting rate about 15% lower. For this reason it is advisable to reserve special disks for the testing of exceptionally hard compounds.

Prevention of Smearing

The abrasive disk is protected from smearing by a constant feed of talc to a brush which rests against the disk. The amount of talc is not very critical, but should be at least 10 grams per 1,000 revolutions of the disk and may be as much as 30 grams without affecting the results. When so protected, oil-extended rubbers, regular rubbers, or other compounds may follow one another without special cleaning of the disk and without altering the cutting power.

Temperature Control

It is not possible to control the temperature independently of such factors as torque and speed. Increasing either torque or speed increases the work done on the samples, most of which appears as heat. If the effect of temperature is to be studied, it must be done at a speed slow enough for the cabinet heaters to maintain a temperature above that normally generated.

Effect of RPM.

The effect of speed on a typical low-temperature polymer ISAF carbon black tread stock was determined for 15,000 revolutions at one foot pound torque. The temperature in the cabinet was permitted to assume its own equilibrium with the test. The temperature at the end of the test was measured by quickly inserting a thermocouple beneath a test piece. The results are shown in Table 1.

TABLE 1, EFFECT OF SPEED ON ABRASION LOSS AND TEMPERATURE

Rpm.	Slip-Miles Per Hour	Inches Loss	Final Temp. °C.
85	1.3	0.100	43
114	1.8	0.11	50
224	3.8	0.195	75
340	5.3	0.252	91
468	7.8	0.360	102
520	8.1	0.390	108
700	10.9	0.485	124
880	13.9	0.595	134

The figures do not give an accurate picture of the heat generated because no correction has been made for the increased loss of heat at higher temperature due to conduction and radiation. The figures indicate strongly, however, that a considerably greater portion of the work is used in the process of abrasion at higher speeds. While the load holding the test pieces against the abrasive to produce a fixed torque is independent of the speed, this load does increase with the temperature. The load increased from about 5.9 pounds at 43° C. and 85 rpm. to 6.9 pounds at 134° C and 880 rpm.

The effect of constant temperature at varying speeds was determined by using the cabinet heaters to maintain the temperature at slow speeds. These tests were run for 15,000 revolutions at one foot pound torque. The load on the test pieces was approximately the same at all speeds to produce one foot pound torque. The coefficient of friction in all tests was about .166-152. The results are shown in Table 2.

TABLE 2. EFFECT OF SPEED AT CONSTANT TEMPERATURE

Rpm.	Temp. under Test Piece, °C.	Inches Loss	Lbs. Load on Test Pieces
590	109	0.382	6.7
468	105	0.366	6.6
348	107	0.310	6.6
224	103	0.264	6.6

The wear increases rapidly with torque. This fact is shown in Table 3, which was obtained with the standard compound running at 468 rpm. Tests were run for 15,000 revolutions, except for the two highest torques which were run until the test pieces were worn close to the cups, and the results calculated to 15,000 revolutions.

TABLE 3. EFFECT OF TORQUE ON WEAR

Ft. Lbs. Torque	Lbs. Load on Test Pieces	Inches Loss	Temp. °C. End of Test	Coeff. Friction
0.25	1.4	0.032	42	.178
0.50	2.8	0.106	78	.178
1.00	6.3	0.400	101	.159
1.50	9.5	0.786	112	.158
2.00	13.8	1.252	120	.145

Discussion of Results

While this abrasion test has shown very good correlation with service with both oil-extended and regular types of tread stocks, it is still subject to the limitations of all other abrasion tests. The principal limitation is the inability to compare two stocks based on different matrices. Natural rubber and styrene-butadiene polymers have sufficiently similar characteristics to be compared. Other elastomers, such as neoprene, butyl rubber, and urethane polymers, however, have different characteristics in regard to temperature effects, hysterisis, stress-strain, rate of recovery, coefficient of friction, etc., so that compounds based on such different matrices must each be studied separately.

The greatest variable in compounds, based on a natural or a SBR type of matrix, is the type and the amount of softener. While talc keeps the abrasive disk entirely clean and the surface of the rubber in a dry condition, it cannot remove the oil from within the surface layer during the time allotted to an accelerated test. A portion of the surface of the rubber which is caught and carried along with a point of abrasive can either be torn away, or it can slip and flow from the point before an elongation, necessary to produce rupture, is reached. Slipping from the abrasive point appears to be increased by the presence of softener, and the effect depends on the type and the quantity of softener. This effect may be of some importance in natural service, but is greatly minimized by the leaching of softener from the surface layer by the very large amount of surface contacted by the rubber and by the much shallower penetration of the average abrading surface into the rubber, in contrast to laboratory abrasion testing conditions.

The following series of compounds and abrasion data will illustrate the effect of a high-viscosity naphthenic oil on abrasion results. Carbon black, sulfur, and accelerator have been altered, as the oil is increased to maintain an approximately equal concentration of vulcanizing ingredients and equal hardness of the vulcanized stock. The abrasion was run at 468 rpm. and one foot pound torque for 15,000 revolutions. The rubber used was low-temperature styrene-butadiene polymer. The data are shown in Table 4.

These results have no meaning when comparisons are made with service life. Oil-extended rubber is a servicable product in tire treads, but as far as only abrasion resistance is concerned, it is somewhat inferior to compounds containing less oil. On the other hand, a comparison of vulcanizing ingredients, fillers,

TABLE 4. THE EFFECT OF OIL ON ABRASION

Compound	A	B	C	D	E	F
Rubber (LTP SBR)	100	100	100	100	100	100
HAF carbon black	45	46	55	57.5	63.5	70
Zinc oxide	5	5	5	5	5	5
Stearic acid	1.5	1.5	1.5	1.5	1.5	1.5
Oil	0	2.	7.5	15.	22.5	30.0
Sulfur	1.8	1.8	1.85	1.9	1.95	2.0
Santocure	1.	1	1.05	1.1	1.15	1.2
Durometer hardness	63	63	61	59	57	55
In. abrasion loss	0.520	0.490	0.410	0.375	0.366	0.360

state of cure, etc., can be made in any given matrix with the machine described in this paper. Urethane rubbers show better wear in service than could be expected from abrasion tests, but comparisons of urethane compounds containing similar plasticizers are probably valid on our machine. Studies such as coefficient of friction, and the temperature coefficients of friction and wear also can be made. Using smoked sheet for reference, the rate of increase in wear as the temperature is increased is less for LTP SBR and greater for urethane rubbers.

Summary and Conclusions

Abrasion tests are of value to the compounder only if all known variables are considered and controlled as far as possible. A constant feed of talc will maintain an open coated abrasive in a standard cutting condition and eliminate smearing of the abrasive surface. A steel plate with an open coat of silicon carbide of controlled grain size can provide a standard cutting rate and eliminate differences in abrasive surfaces. With a clean standard cutting surface available it is possible to conduct abrasion studies which will decrease considerably the need of service tests.

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Radiation Effects in Elastomeric Vulcanizates

(*Continued from page 77*)

decrease in crystallinity as temperature is raised. At 400° F., cross-links are actually broken, and a sharp decrease in tensile strength occurs.

The irradiated vulcanizates have lower tensile strengths than the controls at temperatures below 400° F. because the high cross-linking level has lowered the ability to crystallize still further. At 400° F., where crystallinity no longer makes a contribution to tensile strength, there are, however, more residual cross-links in the irradiated vulcanizate after the hot tensile test. In fact, the increase in tensile strength is very nearly proportional to the increase in the number of cross-links remaining after the high-temperature test.

Summary and Conclusions

Natural rubber vulcanizates offer the best overall properties for a compound which may be subjected to gamma radiation. This point is especially true in situations in which the product must withstand flexure. The tensile strength at 400 and 500° F. of natural rubber vulcanizates is improved by radiation induced cross-linking.

Cross-linking data obtained through equilibrium swelling measurements have been used to follow network changes produced by irradiation of both uncured and cured natural rubber compounds. The data correlate well with changes in the physical properties of irradiated natural rubber compounds and indicate that nuclear radiation may be of value in the development of heat resistant, elastomeric products having good flexing characteristics.

Acknowledgment

The authors wish to thank the members of the Firestone research staff for their interest and assistance in this work and the Firestone Tire & Rubber Co. for permission to publish these results.

(*Concluded on page 90*)

Electronically Sorted Punched Cards For Polymer Compounding Data[1]

By ROBERT F. NEU
Enjay Laboratories, Linden, N. J.

One of the major problems of any laboratory in the rubber or other manufacturing industries is recording and maintaining the usefulness of the great masses of useful data accumulating in notebooks, reports, etc.

A description of a compact, efficient, punched-card technical data filing and sorting system that has been found by one laboratory to be extremely flexible and helpful is found in this paper. The use of an electronic statistical machine is essential to the most effective use of this system. Suggestions for the design of card and data report forms are included.

THE greatly increased research activity today, particularly in the competitive synthetic rubber industry, is leading to the accumulation of great masses of useful data in notebooks, file cabinets, correspondence, reports, etc. One of the major problems of any research laboratory is that of recording these data in such a manner that they maintain their usefulness by being readily available for future reference. This is no easy task! In polymer compounding it is further complicated by the large number of physical and chemical tests which may be run on a given vulcanizate. In a technical service laboratory, data must not only be available —they must be found quickly. Inaccessibility of previous data leads to duplication of laboratory effort, loss of time searching files, inability to derive compounding cause-and-effect relation, and, finally, less efficient service to a customer.

It soon becomes apparent that, despite its possession of outstanding facilities for acquiring good technical data, a research laboratory would be doing those whom it serves a disservice if it did not also develop efficient methods for keeping these data readily accessible for all interested parties. Fortunately, developments in the field of electronic data processing have also been rapid.

The following is a discussion of the compact, efficient, punched-card technical data filing system now in use at the Enjay Laboratories. It has proved itself to be extremely flexible and helpful and is suggested as a technique by which other polymer laboratories may profit.

Data Processing

Data processing in a polymer laboratory can be divided into three phases:

1. The first phase is the *initiation of laboratory work and initial recording of data on standard report forms.* Responsibility for this phase should rest entirely with the professional man. Some form of standard data sheets is necessary. Initiation of laboratory work can begin with a master data sheet such as shown in Figure 1. This sheet contains all information not to be placed on punched cards (for example, recipe, test instruction, special test data not punched on cards, etc.). This form is filled out in triplicate, with the original going immediately to the data processing clerk, one copy to the laboratory technician, and one retained by the professional man. The copy with the clerk insures control over seeing that tests specified are actually run and recorded at some future date.

[1] Presented before the 1957 Joint Conference, Divisions of Rubber Chemistry, ACS and CIC, Montreal, P.Q., Canada, May 16, 1957.

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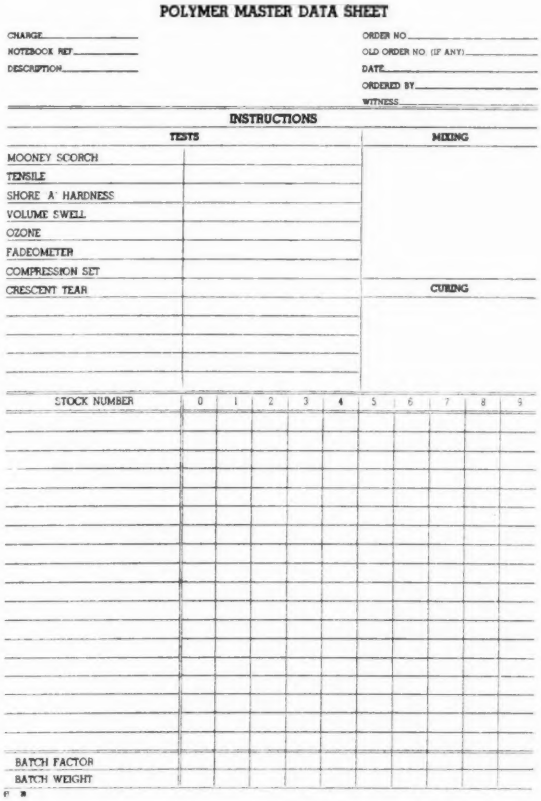
Robert F. Neu, group head, high polymers non-transport section, Enjay Laboratories, received the degree of bachelor of chemical engineering from Cornell University in 1950.

He was employed by Atlantic Refining Co. from 1950 until 1953. From 1953 until 1955 he served in the Chemical Corps of the U. S. Army and in 1955 joined Enjay Co., Inc.

He is a member of the American Chemical Society and its Division of Rubber Chemistry, Alpha Chi Sigma, and the Cornell Society of Engineers.

Once tne tests have been run, the results must be recorded on standard report forms. As can be seen in Figures 2 and 3, the report forms are set up to correspond exactly to the layout of the cards. Thus, once the report forms have been properly filled out, the card punching operation becomes completely routine for the clerk—there is no need for her interpreting, coding, or rounding off of data, or even of determining where any given data are to be punched on a card.


POLYMER MASTER DATA SHEET

CHARGE
NOTEBOOK REF.
DESCRIPTION
ORDER NO.
OLD ORDER NO. (IF ANY)
DATE
ORDERED BY
WITNESS

INSTRUCTIONS

TESTS

MOONEY SCORCH
TENSILE
SHORE 'A' HARDNESS
VOLUME SWELL
OZONE
FADEOMETER
COMPRESSION SET
CRESCENT TEAR

MIXING

CURING

STOCK NUMBER | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

BATCH FACTOR
BATCH WEIGHT

Fig. 1. Master data sheet used for initiating laboratory work

At Enjay Laboratories four separate forms are necessary to record all the test data which might be of interest for any given vulcanizate. As can be seen from Figure 2, Form #1 contains primarily cure and stress-strain information. In addition to specific information about compound type (by end-use) and the customer for whom the work was done, space is available for stress-strain and volume swell data at four different cure times. This information, coupled with scorch and viscosity data, gives a pretty good picture of the curing characteristics of the compound. Tensile strength is punched only to the nearest 100 psi.; while elongation is reported to the nearest 10%. Careful consideration of test methods and their accuracy before setting up card forms can lead to considerable economy of space on the card.

Form #2 involves most of the common physical tests run on a vulcanizate other than stress-strain data. Form #3 is concerned primarily with aging tests; while Form #4 is concerned with electrical tests. These three forms are laid out in similar fashion to Form #1, with headings corresponding to those on cards #2, #3, and #4 in Figure 3.

The responsibility for interpreting raw data and any coding that may be necessary to put the data on these standard forms again rests entirely with the professional man. For convenience in use an attempt should be made, wherever possible, to eliminate any coding of information and rather to record numerical information directly. In many cases, however, coding is necessary, and Tables 1 and 2 show typical examples of some types of coding which can be used.

TABLE 1. CODES FOR COMPOUND TYPE

Codes:

Col. 6	Col. 7	Col. 8
0 Butyl	0 Molded	0 Mech. goods
1 SBR	1 Extruded	1 Proof goods
2 Natural	2 Friction	2 Footwear
3 Nitrile	3 Coating	3 Hose
4 Neoprene	4 Cement	4 Belt
5 Hypalon	5 Sponge	5 Sheeting
6 Reclaim	6 Electrical	6 Tube
7	7 Latex	7 Tire
8 Experimental	8 Experimental	8 Adhesive
9 Misc.	9 Misc.	9 Sundries & misc

TABLE 2. CODES FOR AGING TESTS

Codes:

Col. 15	Col. 16
0 Air oven	0 ASTM Oil #1
1 Air bomb	1 ASTM Oil #3
2 Oxygen bomb	2 Non-ASTM oils
3 Test tube	3 Oxygenated hydrocarbons
4	4 Synthetic lubes
5	5 Vegetable oils & fats
6	6 Acids
7	7 Other chemicals
8	8
9 Other	9 Other

Once these standard data forms have been filled out, they are forwarded to the data processing clerk, who first checks to see that the tests required on the master data sheet have actually been run and reported on the standard data forms. Any special tests which cannot be handled by the punched card can be recorded on the back of the master data sheet.

Once the other data have been punched on cards, the master data sheets become the most important information outside of the card file and must be safeguarded. One effective method of filing is to transpose this file of raw data sheets to a microcard file, wherein one three by five card contains the master data sheet with all its attendant data records, as shown in Figure 4. A duplicate film roll can be kept in security vaults.

2. The second phase of this data processing scheme is *punching the data on to cards.* This is done by the data processing clerk on a standard printing keypunch machine. Naturally, four separate card forms are nec-

essary, one for each of the standard data sheets. The different cards can be distinguished by colored stripes. Operating in this manner, we already have about 8,000 cards, representing some 3,500 butyl rubber compounds in our own rapidly growing file. In addition, developments in the compounding of other polymers by other

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ENJAY LABORATORIES

POLYMER DATA SHEET NO. 1

ORDER NO. _____

ORDERED BY _____

X R	COMPOUND NUMBER						TYPE			CUSTOMER		MOONEY SCORCH @ 250°F MIN. TO 3 PT. RISE ABOVE MINIMUM		COMPOUNDED MOONEY PLASTICITY @ 212°F MINIMUM VALUE			CURE TEMPERATURE, °F			FIRST CURE: CURE TIME MINUTES		TENSILE STRENGTH, P.S.I.		ELONGATION, %		100% MODULUS, P.S.I.		300% MODULUS, P.S.I.	
	1	2	3	4	5		6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
													MIN.						°F		MIN.		00#		0%		0#		00#
									CODE		CODE																		
											NAME												ACTUAL						ACTUAL
									ACTUAL TYPE																			

FIRST CURE (cont'd): VOLUME SWELL, %				T_{50}, °C BELOW 25°C		SECOND CURE: CURE TIME MINUTES		TENSILE STRENGTH, P.S.I.		ELONGATION, %		100% MODULUS, P.S.I.		300% MODULUS, P.S.I.		VOLUME SWELL, %			T_{50}, °C BELOW 25°C		THIRD CURE: CURE TIME MINUTES		TENSILE STRENGTH, P.S.I.		ELONGATION, %	
29	30	31		32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
			%		°C		MIN.		00#		0%		0#		00#			%		°C		MIN.		00#		0%
			ACTUAL					ACTUAL						ACTUAL					ACTUAL				ACTUAL			

THIRD CURE (cont'd): 100% MODULUS, P.S.I.		300% MODULUS, P.S.I.		VOLUME SWELL, %			T_{50}, °C BELOW 25°C		FOURTH CURE: CURE TIME, MINUTES		TENSILE STRENGTH, P.S.I.		ELONGATION, %		100% MODULUS, P.S.I.		300% MODULUS, P.S.I.		VOLUME SWELL, %			T_{50}, °C BELOW 25°C		OPTIMUM CURE TIME, MINUTES	
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
	0#		00#			%		°C		MIN.		00#		0%		0#		00#			%		°C		MIN.
						ACTUAL						ACTUAL						ACTUAL					ACTUAL		

CODES:

COLUMN 6
0 BUTYL
1 GR-S
2 NATURAL
3 BUNA N
4 NEOPRENE
5 HYPALON
6 RECLAIM
7
8 EXPERIMENTAL
9 MISC.

COLUMN 7
0 MOLDED
1 EXTRUDED
2 FRICTION
3 COATING
4 CEMENT
5 SPONGE
6 ELECTRICAL
7 LATEX
8 EXPERIMENTAL
9 MISC.

COLUMN 8
0 MECHANICAL GOODS
1 PROOF GOODS
2 FOOTWEAR
3 HOSE
4 BELT
5 SHEETING
6 TUBE
7 TIRE
8 ADHESIVE
9 SUNDRIES & MISC.

COLUMNS 9-10
00 – EXPERIMENTAL
01 THRU 98 – GIVE CUSTOMER NUMBER FROM SEPARATE FILE.
99 – COMPOUND KNOWN TO BE USED IN FIELD.

X – R
COLUMN 1: X – 1960-1969
R – 1970-1979
NEITHER – 1950-1959
COLUMN 7: X – MINERAL FILLED, LIGHT COLORED
R – MINERAL FILLED, DARK COLORED
NEITHER – BLACK

Fig. 2. Example of data sheet for recording results of tests

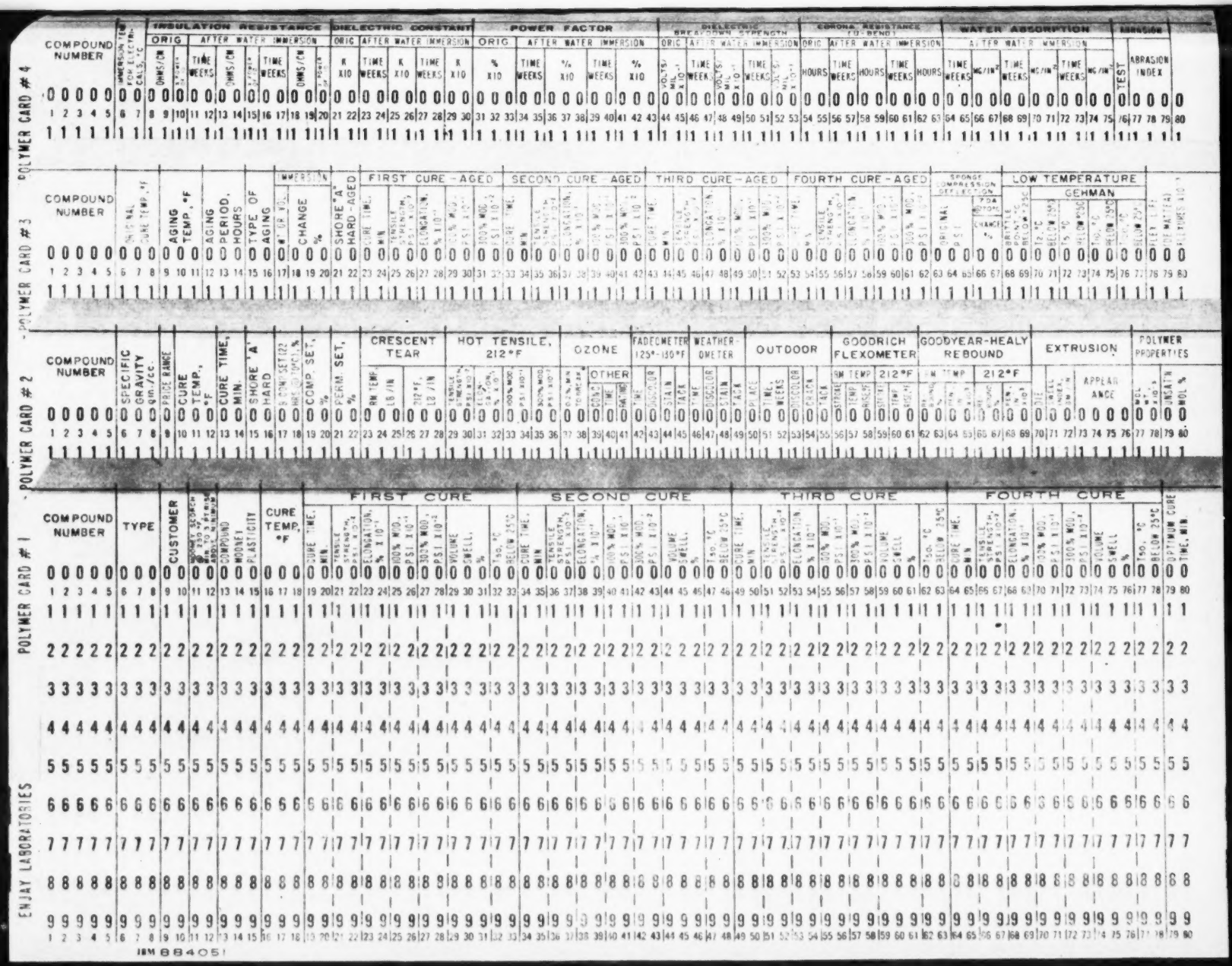

Fig. 3. Punch-card forms for compounding test results

laboratories can be incorporated into the file by transferring data from the literature and abstract services (e.g., The Rubber Formulary)[2] to these punched card forms.

3. With all this information in the files on punched cards, how, then, does one proceed to phase three of this data processing and *search the file rapidly and efficiently?* The relatively new Model 101 IBM electronic statistical machine[3] or its equivalent seems ideally suited for the purpose. From the photograph (Figure 5), it looks very much like an ordinary sorting machine.

While an ordinary sorter, however, searches only one of the 80-card columns at a time, this machine will carry out the following operations: (1) It will search, in one pass of the cards through the machine, several card columns (that is, for a combination of properties) simultaneously, at the rate of 450 cards a minute. The machine currently being used at the Enjay Laboratories can search up to 20 of the 80-card columns (i.e., something like 6-10 properties) simultaneously. Capacities up to 60 columns simultaneously are available. Since in polymer compounding research a combination of properties is usually needed to solve a particular problem, this feature is by far the most important single feature of the statistical machine. (2) The machine will check its own work and "tell the operator" if it has made a sorting error. (3) It will tabulate a limited amount of data (for example, compound serial number) from desired cards on the typewriter carriage attached to the machine. (4) It will count the number of cards falling into the various pockets, thus permitting frequency distribution and correlation analyses to be made. (5) It will accumulate totals of the values punched in given fields on specified cards, thus carrying out the beginnings of statistical calculations.

It should be mentioned here that an existing data processing installation employing high-speed single-column sorters could be used with this system. A search for a combination of properties would simply require several passes of the punched cards through the sorter.

Searching for Specific Properties

How, then, can these characteristics of the machine be utilized to make it flexible and perform the many operations required of it? By far the most important application is that of searching the file for a compound possessing a combination of specific properties. These properties may be specified exactly or may fall anywhere within a specified range. For example, assume a compound is desired which possesses a combination of the following properties: good extrudability (as recorded by some coded index), a Shore A hardness between 56-65, and a compression set value below 30%. In order to have the machine perform the proper file search, a control panel must be wired. Although it looks quite complex (Figure 6), this panel took only 20 minutes to set up.

The wiring of such a control panel can be quite easily learned by a person having no previous data processing experience, in a short course given by the equipment manufacturers. This panel is wired to select only those compounds having all three desired properties, to send them to a given pocket, and to print their serial numbers on the typewriter carriage.

Of course a compound having all the desired properties will not always exist in the file, either through its own shortcomings, or through a lack of data on a given property. This possibility has been anticipated by also wiring to sort into other pockets those compounds which meet at least two of the three desired properties. In this way, although a direct answer may not be found by a file search, there is at least established a sound starting point for some laboratory effort, again, streamlining any efforts to solve the compounding problem.

The cards pass through the machine at a rate of 450 per minute. The machine simultaneously searches all three fields in which these properties are recorded. When it finds a card meeting all three properties, it will direct it to the specified pocket and stop sorting long enough to type the serial number of the compound; then it proceeds to sort the rest of the deck in similar fashion. Should there be a compound meeting only two of the properties, the machine will send this card to another pocket, will not print its serial number, and will continue to sort the rest of the deck. At the end of the run, the typewritten sheet contains the compound numbers of all compounds in the file which meet all three desired properties. With these compound numbers known, the formulation can easily be found by referring to the microfilmed master data sheets which are filed numerically by compound number.

If there is no compound which meets all three properties, those cards in the other pockets can be visually examined to determine their shortcomings. From the serial number punched and printed on the card, the formulation can be determined as above, and necessary compounding changes made in the laboratory to meet the missing property.

Thus, with a given file of about 4,000 compounds, this problem requires about 20 minutes to wire up the control panel and roughly 10 to 15 minutes to run the cards through the machine, thereby yielding a complete file search and answer in something under an hour. In addition, this answer is the complete answer; in other words, no compounds have been overlooked.

Another interesting application is as follows. We recently had occasion to mix and test a large series of compounds, over 800 in number, for the evaluation of many fillers and accelerator systems in Enjay Butyl. Complete physical and chemical tests were run on all compounds, and the results tabulated in a large report. The data, although valuable when you could find them, were very difficult to find, since there was no particular order by which they were recorded.

It was desired to present the highlights of these data in some meaningful order which would increase their value to both laboratory and sales personnel.

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[2] The Rubber Formulary, P. O. Box 1568, Bakersfield, Calif.

[3] International Business Machines, 590 Madison Ave., New York, N. Y.

Therefore, with all the data punched on cards, the cards were run through the statistical machine and arranged first by filler type (i.e., black and mineral filled), then within each of these classifications, by Shore A hardness ranges, and within each hardness range, by decreasing tensile strength. The total time to run all the cards (about 1700) and get the tabulations of serial numbers in proper order for *all* desired breakdowns was about two hours (including wiring of the board). This corresponds to a time of about eight hours for one man to probe into the report and visually take out only those compounds of *one* type of filler and *one* hardness range in order of decreasing tensile strength. Since two filler types, each with six hardness ranges, had to be classified, well over 50 man-hours were saved on this one project.

Fig. 4. Microcards of master data sheet and viewing means

This problem mentioned in the preceding paragraph also illustrates another technique in handling this equipment. Tensile data were found on card #1 and hardness data on card #2. This situation necessitated preparing two separate lists of compound serial numbers, one for each card form and then manually cross-checking these lists to prepare the final tabulation in proper order. Such checking, in itself, is somewhat time-consuming and indicates the desirability of having hardness values punched on both cards 1 and 2, since almost every request for compounding information entails some tensile and hardness specification. We have since incorporated this improvement into our system.

As a file builds up in numbers of compounds, sorting for any given problem can be simplified by maintaining separate files—black compounds in one drawer, mineral filled compounds in another. As the file gets

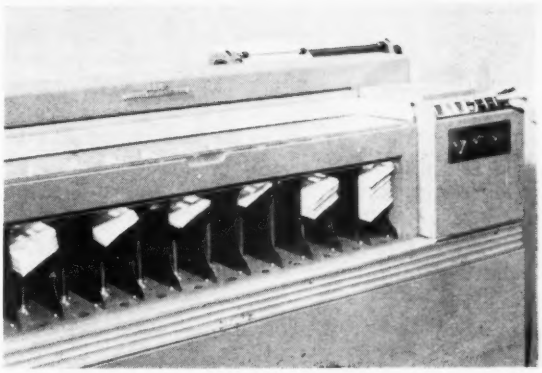

Fig. 5. IBM electronic statistical machine Model 101 for card sorting

even larger, this can be further refined by breaking down either of these files into tensile or hardness ranges or any other common denominator.

A third application involves a combination of the one just mentioned with the card counting feature of the machine. Assume the compounds have been sorted into the hardness groups for both black and mineral filled compounds, and that within each hardness group an idea is desired of how many compounds have been mixed of different compression set ranges, extrusion properties, ozone resistance, and tear resistance. This sorting can be done in five passes of the cards through the machine using only one control panel. On the first pass, all cards are counted by hardness groups while being sorted into compression set groups. A special master card is inserted behind each compression set group; the cards are restacked and fed through the machine a second time. On this second run, the cards are again counted by hardness groups, but this time at the end of each compression set group the machine automatically stops long enough to print the card counts by hardness ranges for that compression set group. While all this is going on, the cards are being sorted on the basis of extrusion prop-

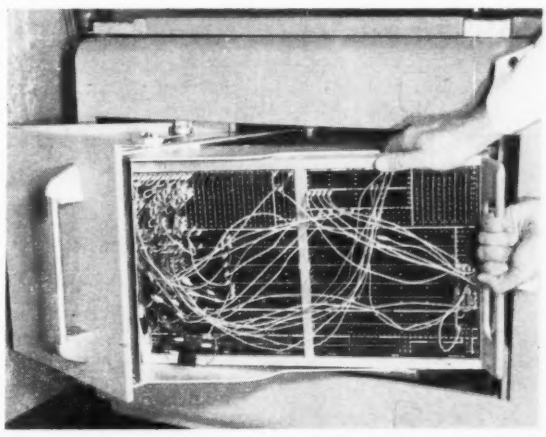

Fig. 6. Control panel wiring for IBM machine for various card-sorting problems

erties for the following run. By means of this technique —counting by one classification and sorting by another —the number of machine passes to prepare such a report is greatly minimized. The final typed report, issued from the machine, is then, in a sense, a frequency distribution pattern of the work performed over a given period of time.

Such a pattern would be helpful in analyzing the areas in which the most effort had gone for a given period and, in addition, is helpful to the research worker in anticipating areas in which no previous work has been done, in other words, where the card count was 0 for a particular combination of properties. These areas can be examined closely, and a decision made whether this has been an oversight, and steps should be taken to fill in the gaps to anticipate requests, or whether these conditions are simply impossible to meet and should be ignored.

In addition, the worker in more fundamental research (e.g., polymerization studies) by using a card form whereon are punched molecular weight, unsaturation, gel structure, and polymerization conditions, among other things, can use this sorting and counting technique as a means to discover trends and correlations which may be buried beneath the mass of data obtained and number of variables being studied.

This approach could also be used in compounding research provided a useful card form for formulation data is designed. Such a form, which requires coding of all compounding ingredients, is currently being developed in Enjay's installation. Remember, it is not sufficient to just punch all the data on a card! Great consideration must be given to how such data will be processed and what the organization wants most from its data processing installation.

Another application for the machine is involved in statistical analyses of results. To evaluate the effect of modulus on ozone resistances, if any such correlation exists, the cards can be passed through the machine, and the sum of the moduli and the sum of the ozone resistances (in terms of crack time or break time) obtained for all the cards under study. These summations (ΣX) are the starting points for any statistical calculations.

This brief discussion on some of the applications of an electronic statistical machine may suggest many other, as yet, unthought of applications. In fact, it has been said that the flexibility of this machine and this type of data treatment is limited only by the imagination of the person wiring the control panel.

Summary and Conclusions

In summary, we feel that electronic sorting of punched cards offers an exciting challenge in the field of treating polymer compounding data. The use of some such system is becoming more and more mandatory in order to keep track of all past data, avoid duplication of laboratory effort, and generally to save time and obtain maximum effectiveness from a limited manpower force.

In order to insure maximum effectiveness of such a setup, tests must be standardized, methods of reporting must be standardized, and the entire procedure made as routine as possible. In addition, the value of the installation must be demonstrated to all professional men who may be expected to use it. Nothing is more disappointing than a valuable machine sitting idle for lack of enthusiasm among the people who could be using it.

For a relatively small group which wishes to obtain maximum flexibility from its data processing setup, we feel that a machine such as the electronic statistical machine offers the most promise for the typical applications we have described above.

Acknowledgment

We are grateful to J. Hugh Macey and his colleagues at The B. F. Goodrich Co. for their generous and invaluable advice in punched-card and report-form design.

Radiation Effects

(*Concluded from page 83*)

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Another First for RUBBER WORLD

Some pages of this issue of RUBBER WORLD are "scored" at the inside margin so as to make it easier for you to detach them for filing. We believe it is the first issue of any rubber-industry periodical to be so perforated for the greater convenience of readers.

This new service is just one of the many RUBBER WORLD readers have enjoyed in recent years. In January of this year the table of contents was placed on page 3 for easier access.

Whether this page perforation becomes an every-issue feature depends on subscriber reaction.

Do you like it enough to tell us so? Please do.

MEETINGS and REPORTS

Rubber Division, ACS, New York Meeting Features Carpenter, Ormsby, New Officers

The seventy-second meeting of the Division of Rubber Chemistry American Chemical Society, was held with the parent Society in New York, N. Y., during the week of September 9. The Rubber Division program was presented on September 11 through 13 at the Commodore Hotel.

Special features of this Rubber Division meeting were the Goodyear Medal Award to Arthur Whiting Carpenter, a talk by Ross R. Ormsby, Rubber Manufacturers Association president, the announcement of the election of new officers and directors for the coming year, the luncheon-meeting of the Division's 25-Year Club, and a fine program of technical papers.

B. S. Garvey, Jr., Pennsalt Chemicals Corp., chairman of the Division, presided at the opening session on the afternoon of September 11, at the business meeting on September 12, and at the banquet at which the Goodyear Medal presentation was made on the evening of the second day. At the end of the last technical session on the morning of September 13, he retired as chairman and received from R. F. Dunbrook, Firestone Tire & Rubber Co., the new chairman, a scroll thanking him for his service as chairman, signed by the ACS president, Roger J. Williams.

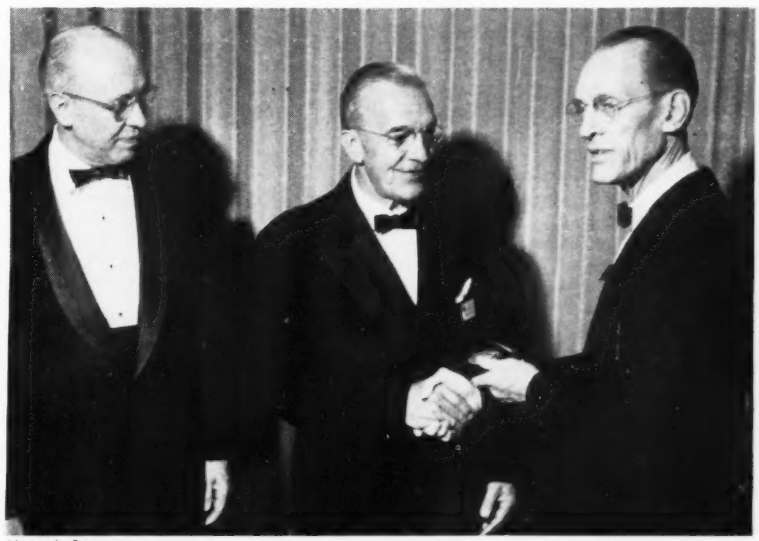
Chairman-elect of the Division is E. H. Krismann, E. I. du Pont de Nemours & Co., Inc., as a result of the letter-ballot for the election of officers and directors announced at the business meeting on September 12.

Total registration for the Society for this New York meeting was more than 15,000. Registration for the Rubber Division meeting only is not available, but attendance at the technical sessions appeared to be at least eight or nine hundred persons.

The chairman of the committee in charge of local arrangements for this New York meeting of the Rubber Division was Henry Peters, Bell Telephone Laboratories. The complete program and abstracts of the papers presented were given in our August issue, beginning on page 702.

25-Year Club Luncheon Meeting

The nineteenth meeting of the 25-Year Club was held on September 11 with W. O. Hamister, Naugatuck Chemical Division, United States Rubber Co., presiding.



Hanns L. Sperr

Presentation of Goodyear Medal to Arthur Whiting Carpenter *(center)* by B. S. Garvey, Jr., Division chairman; A. E. Juve, chairman, Goodyear Medal Award Committee, on left

After extending a welcome to those present and expressing his appreciation for his selection as chairman for the meeting, he welcomed the new members of the 25-Year Club.

E. B. Curtis, recently retired from R. T. Vanderbilt Co., then conducted the elimination contest for the member present with the longest record of service in the rubber industry, who had not previously been so honored. H. J. Muehlstein, president of H. Muehlstein & Co., Inc., with a record of 49 years' service in the industry was the winner of this contest and the memento commemorating the occasion. The names of previous winners of the honor at meetings of the 25-Year Club were read also.

A moment of silence was observed as tribute to Club members who had passed on since the last meeting. These were: C. F. Wahl, Pratt & Letchworth; R. Dutt, General Tire & Rubber Co.; C. C. Davis, Boston Woven Hose & Rubber Co. Division of American Biltrite; and D. A. Comes, Farrel-Birmingham Co., Inc.,

It was announced that H. S. Karch, C. P. Hall Co., would be the chairman for the next meeting of the Club to be held at the time of the meeting of the Rubber Division in Cincinnati, O. May 13-16, 1958.

The Goodyear Medal Address

The Goodyear Medal Address given by Arthur Whiting Carpenter on the morning of September 12 was entitled "The Tower of Babel." The Medalist first reviewed this historical and Biblical story and said that it had come to mind when the Division had done him the honor of asking him to be the Goodyear Medalist of the Division for 1957 because the physical and mechanical testing of rubber has often exemplified the confusion which exists when people do not understand each other because of conflicting data. When, through research, development, and standardization, these people become one and are given the same language, there is, in truth, to use the Biblical quotation, little which "will be restrained from them which they have imagined to do," Mr. Carpenter pointed out.

Cooperative effort in attaining unifica-

R. F. Dunbrook, 1957-58 Division chairman

tion has had much to do with the progress made in the 30 years he has worked in the field of rubber testing, and this Goodyear Medal Award is therefore recognition not only of his own contribution, but also those of his associates in The B. F. Goodrich Co. and in the committees of the American Society for Testing Materials and the Division of Rubber Chemistry of the ACS, he added.

Development of physical test methods since the discovery of the vulcanization of rubber by Charles Goodyear in 1839 were reviewed, but physical testing, as we know it, cannot be said to have existed prior to the dawn of the Twentieth Century the Medalist said. Great reliance came to be placed on chemical rather than physical testing in the early 1900's, but nevertheless during the first decade of the new century economic and technological factors developed to direct emphasis to physical means of determining rubber and rubber product properties. The first testing machines were developed and a spreading system of specification purchasing in industry culminated in the organization in 1911 of Committee D-11 on Rubber Products of the American Society for Testing Materials. The first ASTM rubber product standards for fire hose and electrical wire and cable were completed in 1915.

Meanwhile, in 1912, the National Bureau of Standards published the first edition of its Circular 38 entitled, "The Testing of Mechanical Rubber Goods." By the end of World War I, testing problems had become so annoying that various agencies began to give them serious attention. New subcommittees on standard procedures for testing rubber products and on chemical methods of test were authorized by Committee D-11. At the same time a committee on methods of analysis was appointed by the Rubber Division, ACS, and a joint meeting between the ASTM and ACS committees was held which resulted in a draft of standard methods of chemical analysis, eventually approved and published by ASTM.

At about the same time ASTM Committee D-11 formed a subcommittee on performance testing, and the Rubber Division, ACS, formed a committee on physical testing. Work sponsored by the Rubber division at the National Bureau of Standards and done by members of the Division in cooperation with the D-11 Committee eventually provided for considerably improved agreement in results for tensile strength tests, elongation and moduli tests.

The need of better tests was realized increasingly, and dissatisfaction with some of the existing product specifications by Committee D-11 caused this group to concentrate on development and standardization of test methods and to leave the question of detailed purchase specifications for reconsideration after the establishment of suitable standard methods of test. With this change in objective, progress became rapid. Rubber Division standard procedure for physical testing was incorporated so far as possible in ASTM methods, and the first special compilation of ASTM Standards on Rubber Products appeared in 1935.

Mentioned also by the speaker were the contributions of the joint SAE-ASTM Technical Committee organized in 1939 and the World War II Government Synthetic Rubber Program to the further improvement of testing and test methods for rubber. The precision of physical testing of rubber reached its highest level during the period of the Government Synthetic Rubber Program.

Despite the great progress made there is still much that remains to be done, Mr. Carpenter declared. The tests presently used are undoubtedly measuring something accurately, but we are not sure just what, and when they fail to evaluate serviceability, it is doubtless because the test and the service involve different conditions of which we do not appreciate the significance, if indeed we are aware of them at all, he added.

The Business Meeting

At the business meeting of the Division on the morning of September 12, Dr. Garvey first asked the members to stand for a moment of silence as tribute to the passing of C. C. Davis, retired and editor of *Rubber Chemistry and Technology*, and John B. Dickson, retired. The Division is planning some further special tribute to Mr. Davis in connection with his long years of service as editor of *RC & T*. David Craig, B. F. Goodrich, has been appointed to the editorship of this Division publication.

It was also announced that a business manager for *RC & T* is to be appointed, as well as an assistant secretary and an assistant treasurer of the Division.

There will be a change made in the by-laws to permit an extra charge of $1 a year for those members who do not pay their dues on time.

The Division will meet separately in Cincinnati, O., May 13-16, 1958, at the Netherlands-Plaza Hotel. E. N. Cunningham, Precision Rubber Products Co., is chairman of the local committee on arrangements. The deadline for papers for this meeting is March 17, 1958.

It was reported that membership of the Division now amounts to 2,619 full members and 525 associate members, for a total of 3,144.

E. H. Krismann, Rubber Division chaiman-elect

Dr. Garvey presented Best Paper Award scrolls to F. W. Boggs, for the paper entitled, "The Physics of the Friction of Rubber on Rough Surfaces," by Dr. Boggs and W. P. Rieman, U. S. Rubber, which was presented at the September, 1956, meeting in Atlantic City, and to W. G. Forbes for the paper, "The Dependence of Tack Strength on Molecular Properties," by Dr. Forbes and L. A. McLeod, Polymer Corp., Ltd., which was given at the May, 1957, meeting in Montreal, P. Q., Canada.

Election of officers and directors for 1957-58 were announced as follows: chairman, R. F. Dunbrook, Firestone; vice chairman, E. J. Krismann, Du Pont; secretary, R. H. Gerke, U. S. Rubber; and treasurer, G. E. Popp, Phillips Chemical Co.

Directors from the areas of certain of the local rubber groups were: Northern California, R. J. Reynolds, Shell Development Co.; Connecticut, W. C. Carter, Pequanoc Rubber Co.; Detroit, R. W. Malcolmson, Du Pont; Southern Ohio, F. W. Gage, Dayton Chemical Products Laboratories; Philadelphia, M. H. Youker, Du Pont; Rhode Island, R. B. Robitaille, Phillips Chemical; and Washington, A. W. Sloan, Atlantic Research Corp. Director-at-large will be Sheldon Nicols, Goodyear Tire & Rubber Co.

RMA Activities

Ross R. Ormsby, president of The Rubber Manufacturers Association, Inc., described the organization and activities of that organization in an invited paper, on the afternoon of September 12.

In introducing Mr. Ormsby, Dr. Garvey said that he had asked him to present this paper on RMA activities because of its value to Rubber Division members who were probably not too well informed on such activities generally, and because he wanted the opportunity to thank the RMA for its continued financial support of such Division activities as the Library, the "Bibliography of Rubber Literature," and *Rubber Chemistry and Technology*. Garvey said he spoke for the Division offi-

cers and members when he expressed his appreciation of the fact that although the RMA asked why the money was needed and how it was to be spent, it then provided the money with no strings attached. Dr. Garvey said he felt that the Division had justified the faith placed in it by the RMA in view of the results achieved by its publications and its Library.

Mr. Ormsby first explained that in addition to its main office in New York, the RMA has a Washington office to provide and maintain liaison with various government agencies on rubber problems and to keep the industry informed on legislative matters, as a part of its function. W. J. Sears, RMA vice president, is in charge of this office and is assisted by C. C. Miller, who handles public relations. Mr. Sears also heads the RMA crude rubber committee which is concerned with the packaging and grading of natural rubber and has recently published international specifications for various grades of such rubber.

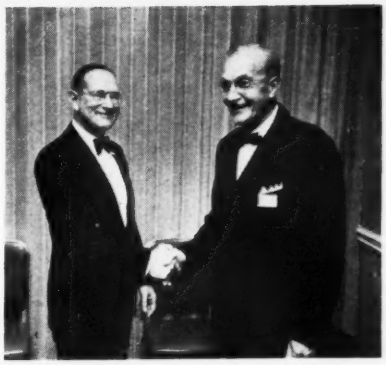
One of the basic functions of any trade association is the compiling and issuance of statistics, and this activity is under the supervision of C. C. Halligan, who also is in charge of the RMA accounting and tax committees. The traffic committee headed by George Gwinup is another important activity in that it is continuously dealing with railroads, steamship lines, and the trucking industry on the complicated system of freight rates for a great variety of end-products as well as for rubber, textiles, carbon black, etc.

The industrial relations committee does not deal directly with any union, but does a research job in cooperation with industry in providing a great variety of information on collective bargaining practices, wage rates, fringe benefits, etc. Lee Martin heads up this committee.

The RMA is basically set up along product lines, and the above committees serve all product divisions. The tire division, service managers committee, tire accessories and repair materials committee, and the heel and sole division have as their chairman George Flint, dean of RMA divisional men, Mr. Ormsby said.

Activities of the rubber footwear, rubber sundries, and flooring divisions are handled by C. P. McFadden. A recent example of cooperative activity here is the tariff problem in the rubber footwear division. Import duties on rubber footwear were recently cut practically in half and by various subterfuges, hundreds of thousands of pairs of footwear have been imported which do not appear on official records. Through the RMA, the footwear division is working to close the loopholes in the law through which competitive products are evading the normal duty and is seeking to obtain adequate and fair protection from the government against the rising tide of imports.

The mechanical rubber goods division, headed by J. J. Catterall, has many subdivisions and is the largest product division from the company representation viewpoint. One of the most important RMA functions in connection with this division as well as other divisions is the liaison provided for the technical committees in connection with specification writing. These technical committees are



Simon Collier, who described Mr. Carpenter and his work, congratulating the Medalist

made up of men from industry rather than RMA staff personnel, and they enjoy a fine working arrangement with the American Society for Testing Materials, American Society of Mechanical Engineers, Society of Automotive Engineers, American Standards Association, and the American Association of Railroads. Many of the members of the RMA technical committees are also members of the Rubber Division, ACS, and Mr. Ormsby expressed the belief that it would be to mutual advantage to build a closer liaison between RMA technical committees and the Rubber Division.

He then went on to explain the efforts of the RMA in connection with the international problems involving natural rubber production and consumption in which the former RMA president, A. L. Viles, had contributed so much. Without these efforts the amount of natural rubber available to this country over the years might have been reduced considerably, this speaker declared.

With the new and great synthetic rubber producing industry in the United States, rubber goods manufacturers are less dependent on natural rubber. In view of the growth potential of the rubber goods manufacturing industry, however, the rubber chemist in many respects holds the key to the future. New and better synthetic rubbers and methods of compounding and processing will be required. Meanwhile, there will still be a market at reasonable prices for all the natural rubber that can be produced, Mr. Ormsby said in conclusion.

Hanns L. Sperr

Ross R. Ormsby discussing "RMA Activities"

The Division Banquet

The regular banquet of the Division was held on the evening of September 12 at the Commodore Hotel and was preceded by the suppliers' cocktail party. The attendance at the cocktail party was high, but, in spite of the Goodyear Medal presentation ceremonies and a very fine entertainment program arranged by the local committee, attendance at the banquet was lower than usual.

The page of photographs (turn over) taken at the cocktail party and at the reception for those seated at the head table should be of interest both to those who may find themselves in these pictures and those who may find friends and acquaintances.

Chairman Garvey presided at the banquet of the Division and first introduced those seated at the head table, including Roger J. Williams, president of the Society; Walter J. Murphy, editorial director of ACS applied journals; A. W. Carpenter, the Goodyear medalist; Ormsby and Sears, of the RMA; and officers and directors of the Division. He then thanked the local committee on arrangements headed by Henry J. Peters for its work in connection with this New York meeting.

Dr. Williams expressed the appreciation of the officers and directors of the Society for the contributions of the Rubber Division.

Dr. Garvey again thanked the RMA as represented by Ormsby and Sears for their continued financial support of the Rubber Division Library and the Division publications "Bibliography of Rubber Literature," and *Rubber Chemistry and Technology*.

The Goodyear Medal Award ceremonies then began with talk on the Medalist by Simon Collier, Johns-Manville Corp. He traced Mr. Carpenter's career from his graduation from Massachusetts Institute of Technology in 1913 with a B.S. in chemical engineering and his obtaining a M.S. degree in 1914, through his work as a chemist in charge of the water purification plant at Alliance, O., and then to assistant superintendent of the Akron, O., water purification plant prior to joining the U.S. Army in 1918.

Mr. Carpenter went to work for the Goodyear Tire & Rubber Co. in 1919. He left Goodyear to become factory superintendent for Holtite Mfg. Co. from 1925 until 1927, when he joined Goodrich as a development engineer. In 1928 he became manager of the Goodrich testing laboratories and remained in this capacity until his retirement in 1955.

During World War II, Goodrich loaned Mr. Carpenter to the War Production Board, where he served as assistant director for raw materials of the National Security Resources Board. For carrying out this assignment, he received the NSRB Distinguished Services Award. It was dur-

EXIT

ing this period that the Medalist, until now a confirmed bachelor, met a charming young lady, Miss Irma Coon, whom he subsequently married.

As manager of the Goodrich testing laboratories, the Medalist's interest in development and standardization of methods of test on rubber and rubber products led him to become an active member and for 28 years secretary of Committee D-11 on Rubber of the American Society for Testing Materials. During the many years as a member of ASTM, he served on the board of directors, then as a vice president and finally in 1946-47, as president of the Society.

In reviewing the life of the Medalist, Mr. Collier emphasized that he immediately became dedicated to any task he accepted, as evidenced by his contributions to the ASTM. Mr. Collier added that in reviewing the list of Goodyear medalists over the years, it was noted that no one had ever been nominated as medalist for work in the field of physical testing. In view of Mr. Carpenter's tremendous contributions to this field he was nominated and elected by the Division of Rubber Chemistry as its Goodyear Medalist for 1957.

A. E. Juve, B. F. Goodrich Co., chairman of the medal award committee, then presented Mr. Carpenter to Dr. Garvey, who in turn presented the medal, the scroll, and the honorarium to the 1957 recipient of this award.

The banquet program was then concluded with entertainment in the form of several outstanding variety acts.

The Rubber Division, the Rubber Groups, and You

The relation between the Rubber Groups and the Rubber Division is so successful that its very success sometimes obscures the independence of the cooperating organizations, and an occasional review of the overall set-up is therefore desirable for officers and members of the organizations involved. This relation depends on what the Division is, what a Rubber Group is, and their separate activities.

So said B. S. Garvey, Jr., of Pennsalt Chemicals Corp., in a series of talks, in his capacity as 1957 chairman of the Division of Rubber Chemistry, American Chemical Society, before several Rubber Groups, during the year.

ACS Set-Up

The American Chemical Society is a national organization of chemists and chemical engineers, which, because of its nature, must maintain adequate standards for its members. To be a full member you must have a degree in chemistry or chemical engineering from a recognized institution and must have had professional practice in either field. In exceptional cases, Dr. Garvey stated, people who have demonstrated their chemical knowledge and ability may be admitted to membership without the degree required.

The Society runs national technical meetings, publishes several technical journals, and conducts many professional and related activities on a broad, national basis. It promotes and aids both Section and Division activities.

The Local Sections are geographic units of the ACS, and any ACS member living in an area which has a Local Section is automatically a member of that Section. These Sections, operating on a local level to bring ACS members together socially and professionally, represent the Society activities on the local basis.

Much of the national activities of the ACS is conducted through its Divisions, more than 20 in number. The national meetings are all organized on a Divisional basis, with the Divisional officers responsible for the programs and the conduct of the meetings. All Division members must be members of the parent Society, and any member of the Society can become a member of a Division by paying its dues.

The ACS recognizes the status of Division Associate, which makes it possible for non-chemists to become Associates. Group members can become associates of the Division of Rubber Chemistry and enjoy all the advantages of Division members except voting or holding office. The associate also receives the Division's publications.

The Sections and the Divisions are parts of the American Chemical Society; their activities are those of the Society, and their officers must be ACS members. The Councillors are elected by the Sections and Divisions to the Council of the Society, its chief governing or legislative body.

Rubber Division Operations

Dr. Garvey then discussed Rubber Division activities of interest to Rubber Groups.

First he mentioned the semi-annual meetings of the Division of Rubber Chemistry, which present the latest results of research and development and which attract chemists from all over the country.

Then he told about *Rubber Chemistry and Technology*, which publishes much of the best of the technical literature on rubber, and the "Rubber Bibliography," which catalogs all the literature on rubber. Both these publications are furnished Division members and associates. The Division, moreover, sponsors publication of important books on rubber and related subjects.

The Division, the speaker went on, also sponsors and operates a library at the University of Akron which makes available to any member of the Division or a Rubber Group a comprehensive library service. This library, according to Dr. Garvey, probably offers the world's most complete collection of literature on rubber and related subjects.

Besides, through its directors and its liaison committee, the Division seeks to help the Groups wherever possible, serving to coordinate activities and information and to help technical and educational programs and other activities. To make this coordination more effective, Division directors are now elected from the geographical areas served by the Rubber Groups.

Rubber Group Activities

The Rubber Groups are independent organizations of people interested in the chemistry and technology of rubber. Membership is open to anyone sufficiently interested to pay his dues and is not limited to only one Group.

According to Dr. Garvey, many Group members are not eligible for regular membership in the ACS. Among these are laboratory technicians without degrees, factory workers, purchasing agents, and salesmen, many with degrees in fields other than chemistry or chemical engineering, and others whose sole qualification is an interest in rubber. These people may come from manufacturing companies, suppliers of raw materials, users of rubber products, or colleges and universities.

In reply to his own question as to what holds such widely assorted groups together the Rubber Division official declared:

"It is a common interest in the technology of rubber and a general recognition that the operation and prosperity of the industry depends on this technology. There are very few positions in the rubber industry where a man cannot do a better job if he has a general knowledge of compounding and processing supported by an elementary knowledge of the chemistry, physics, and engineering of the materials and their use. These facts, rather generally recognized in all branches of the rubber industry, are the foundation of the Rubber Groups."

Dr. Garvey then explained how the Groups meet the technical and social needs of their members.

The first attempts were through evening lectures given two or three times a year on selected phases of the rubber industry; such technical lectures are still the main features of most Group programs. An expansion of the technical lecture now very popular is the symposium on a special subject, conducted by a panel of experts, each of whom presents a short talk on one phase of the subject, and followed by questions previously submitted in writing and, if time permits, questions from the floor.

On a more elaborate scale are the courses in rubber technology sponsored by many Groups. While some courses are given in cooperation with universities and may even rate college credits, continued the speaker, they are not to be considered advanced technical courses. Rather, they are aimed chiefly at the educated layman, executives, salesmen, purchasing agents,

and technicians and give a broad, general picture of the technology of the industry.

On the lighter side, the Groups have dinners and social hours several times a year; also a Christm party or an annual dance; and one or more outings during the summer.

For the most part Group activities are independent of the ACS, and Group officers need not belong to the Society.

Relation between Division and Groups

With such varied backgrounds among Division and Group members, you may well wonder why such Groups have any relation to the Division of Rubber Chemistry.

Dr. Garvey believes the reason is most Groups were started by Division members, often with the help and the advice of the Division as an organization. Its officers and members have maintained their interest in and cooperation with the Groups. This relation has become formalized to the extent that it is definitely recognized in the by-laws of the Division and generally accepted by the Groups.

Since so many Group members are not chemists, the speaker explained, the Groups may not become part of the Division; hence the Groups are "sponsored." Through this sponsorship the Division gives the Groups a loose national organization whereby common problems can be considered jointly and whereby such coordination as is deemed necessary can be achieved. This sponsorship of the Groups by the Division and the fact that so many Group members are also Division members afford the Groups technical prestige and industry status they would not otherwise have. The cooperation on a national basis has helped raise the level of the technical meetings and the educational programs of the Groups.

At present 14 Rubber Groups are sponsored by the Rubber Division, and a fifteenth, operating successfully in the South with the support of the Division, may be officially sponsored in a year or so.

To the Divison, the speaker continued, the Rubber Groups form the broad base of membership and support which has made the Division of Rubber Chemistry one of the largest and most active in the ACS. Group participation in Division meetings has contributed much to their smooth operation and excellent attendance.

In conclusion Dr. Garvey declared:

"The Division and the sponsored Rubber Groups, with their operations which are at the same time independent, interdependent, and cooperative, bring to their members not only vital technical information, but also a broad understanding of all the ramifications of the rubber industry. This combination of breadth and depth, rare in most industries, is good for the individual, for his company, and for the industry as a whole."

Polymer Lecture Series Planned at Akron U

F. A. Bovey, of Minnesota Mining & Mfg. Co., inaugurated the eleventh annual series of the Akron Polymer Lecture Group on October 4 with a discussion of "Fluorochemical Polymers."

The lecture series, conducted under the auspices of the University of Akron, Akron, O., will continue once a month until May, 1958, with meetings beginning at 8:00 p.m. in Room 107, Knight Hall, University of Akron.

The seven remaining speakers and the subjects of their lectures are as follows:

November 1: J. C. Mackey, Dow Chemical Co., "Ziegler Catalytic System."

December 6: C. G. Overberger, Polytechnic Institute of Brooklyn, "Some New Aspects of Ionic Polymerization."

January 3, 1958: John C. Bailar, Jr., University of Illinois, "Coordination Polymers."

February 7: F. Bueche, University of Wyoming, "Molecular Motion and Physical Properties of Rubber and Plastics."

March 7: Leroy S. Moody, General Electric Co., "Lexan Polycarbonate Resins."

April 11: J. A. Sauer, Pennsylvania State University, "Nuclear Magnetic Response and Mechanical Properties of Polymers."

May 9: J. J. Hermans, Cellulose Research Institute, New York State College of Forestry, "Rheology of Dilute Polymer Solutions."

Inquiries should be addressed to Dr. R. Leshin, Vice Chairman, Research Laboratory, The Goodyear Tire & Rubber Co., Akron 16, O.

Society of Rheology 1957 Annual Meeting

The Society of Rheology will hold its 1957 annual meeting in Princeton, N. J., November 7, 8, and 9. The technical sessions will be held at the Textile Research Institute. An important feature of the meeting will be the award of the Society's Bingham Medal, Thursday evening, November 7.

The Committee for the Bingham Medal, with Prof. John D. Ferry as chairman, has selected Clarence M. Zener (director of the research laboratories of Westinghouse Electric Corp.) as this year's Medalist, in recognition of his important work on the viscoelastic behavior of metals. The presentation of the medal will include a discussion of the research activities of the Medalist by Arthur S. Nowick, of the IBM Watson Laboratory, Columbia University.

Papers of interest to rubber technologists which will be given at the 1957 annual meeting are:

November 7, Morning—

Coalescence of Latex Dispersions. G. L. Brown.

November 7, Afternoon—

The Dynamic Mechanical Properties of Some Fluorinated Elastomers. K. E. Owens, C. A. Dahlquist.

The Low-Temperature Transition in Polytetrafluoroethylene. N. G. McCrum.

A Torsion Pendulum for Dynamic and Creep Measurements on Soft Viscoelastic Materials. D. J. Plazek, M. N. Vrancken, J. W. Berge.

The Dynamic Mechanical Properties of a Model Filled System: Polyisobutylene—Glass Beads. R. F. Landel.

November 8, Morning—

Use of Viscosity Measurements for Study of Entanglement in Polymer Solutions. S. H. Maron, N. Nakajima, I. M. Krieger.

November 8, Afternoon—

On Relaxation Spectra in High Polymers. B. Albrecht, A. M. Freudenthal.

Approximate Equations for Interconverting the Various Mechanical Properties of Linear Viscoelastic Materials. T. L. Smith.

The Viscoelastic Behavior of Polyvinyl Chloride Compositions in Combined Torsion and Tension. J. T. Bergen, D. C. Messersmith, R. S. Rivlin.

November 9, Morning—

On the Motion of Plastic Mass. C. Torre.

The Tensile Strength of SBR Elastomers. L. M. Epstein, R. P. Smith.

Shear Rate Dependence of the Viscosity and Elastic Compliance of Polymer Melts; Correspondence with a Hydrodynamic Theory of Viscoelastic Flow. R. H. Boyd.

Another FIRST for RUBBER WORLD

The pages of this issue of RUBBER WORLD are "scored" at the inside margin so as to make it easier for you to detach them for filing. We believe it is the first issue of any rubber-industry periodical to be so perforated for the greater convenience of readers.

This new service is just one of the many RUBBER WORLD readers have enjoyed in recent years. In January of this year the table of contents was placed on page 3 for easier access.

Whether this page perforation becomes an every-issue feature depends on subscriber reaction.

Do you like it enough to tell us so?

R. G. Seaman, Editor
RUBBER WORLD
386 Fourth Avenue
New York 16, N. Y.

SAE-ASTM Technical Committee Activities Expanded

Activities of the SAE-ASTM Technical Committee on Automotive Rubber have been expanded and intensified during the past year with the object of improving the workability and flexibility of the various specification tables covered by ASTM D 735-57T, Specifications for Automotive Elastomer Compounds. According to a report of the June 13-14, Detroit meeting of Technical Committee A, prepared by J. M. Ball, Midwest Rubber Reclaiming Co., test methods for all properties and minimum values for these various properties will be established.

Expanded D 735 Tables

To improve the flexibility of the present D 735 tables and to make them as nearly universal in their application as possible, one basic table has been prepared. In the expanded D 735 system, basic requirements for all properties will be incorporated for all classes of compounds, and there is to be one large suffix table listing permissible changes in durometer, tensile, elongation, and volume swell under various conditions of aging. The suffix table is broken down into various classes of compounds, and each class is broken down into sub-classes which indicate different levels of severity of the test. T. M. Loring, Chicago Rawhide Mfg. Co., is chairman of the subcommittee in charge of this work.

It is hoped that the details will be worked out for this basic table in time for presentation to the International Standards Organization meeting scheduled for this country in the Fall of 1959.

Ozone Testing

Reasonably comparable results for ozone resistance of rubber compounds are now being obtained for tests run in ozone cabinets made by different companies. Two test compounds, designed with the hope that they would be helpful in distinguishing between various ozone concentrations and various times of test, were used. Since no wax is necessary with neoprene compounds, they were made of this elastomer, and the two compounds used differed only in the amount of black and oil loading, one containing 55% neoprene by volume and the other 35% neoprene.

The tests were run at 100° F.; the ozone concentrations were 0.25-, 0.50-, and 0.75-part per million; the times were 24, 48, and 72 hours; and the air flow in the test cabinet was kept constant at 4.5-5.5 cubic feet per minute.

The 55% neoprene compound showed somewhat less cracking than the 35% neoprene compound. Testing for ozone resistance by this accelerated method in ozone cabinets appears to be quite feasible, and the variations in ozone concentration experienced in outdoor testing at various locations are possible of elimination.

Butyl Rubber Tables

Tables for butyl rubber compounds are to be drawn up in final form and submitted to letter-ballot in section 4 of Technical Committee A. Data will be accumulated as a basis for suffix requirements.

Flexing

Certain compounds that have performed satisfactorily will be selected for a testing program, keeping in mind the two types of flexing experienced on the Goodrich flexometer and the De Mattia machine. If possible, the work will be done on compounds of 40, 50, and 60 durometer hardness made from various elastomers. The data will then be correlated for the purpose of trying to establish minimum values.

Fluid Aging

The subsection of fluid aging has eliminated ASTM No. 1 oil from Tables 3 and 4 of D 735, by a letter-ballot vote. The suffix E-1 is now to include volume change as well as tensile requirements. It was voted also not to change suffix E-1 requirements to comply with Army Ordnance specifications on tensile and elongation for SC type stocks since the needs of the automotive industry are met with by the present specifications, and special military requirements should be taken care of by separate product specifications.

The program on the effect of aromatic fuels on rubber is to be enlarged to include neoprene compounds and gasolines presently in use, and those contemplated during the next few years will be investigated. Grades suitable for continuation of the subcommittee's test program will be recommended.

No positive conclusions have yet been reached regarding duplicability of aging tests at 300° F. A task group has been reactivated to study the effect of oil additives on typical oil-seal recipes.

Tear Resistance

Plans call for accumulating data on tear resistance for various compounds such as those having tensile strengths below 1,000 psi., between 1,000 and 2,000 psi., and above 2,000 psi.

Cellular Rubber

Two methods of test from the Society of the Plastics Industry, one on polyvinyl chloride and the other on flexible urethane foam, will be letter-balloted in the proper subsection.

Announcement of the new SPI subcommittee on closed-cell vinyl foam was made.

Impact Testing

A short glossary of terms used in impact testing was revised. The possibility of describing a standard test method independent of the shape and dimensions of any particular machine were discussed.

Revision of Tables

The temperature for suffix F-2 was changed from —65 to —67° F. in order to provide for rounded Centigrade figures and to conform with ASTM D 1349, Recommended Practice for Standard Test Temperatures for Rubber and Rubber-Like Materials. It was also recommended that oven-aging test temperatures be revised to conform with those in ASTM D 1349, all subject to letter-ballot approval, of course.

Either the open-oven method or the test-tube method may be used for temperatures of 158° F. (70° C.) and 212° F. (100° C.). For temperatures higher than 212° F., only the test-tube method, ASTM D 865, may be used, and for a referee method only D 865 may be used. These changes are also subject to letter-ballot approval.

A shorter test period of 22 hours for compression set testing instead of the present 70-hour test period is to be investigated since it would save considerable testing time in all the rubber laboratories in the country.

1958 Maintenance Show

The 1958 Plant Maintenance & Engineering Show, which returns to Chicago for the first time in three years next January, will be the largest in its history. The show is scheduled for the International Amphitheatre, January 27 to 30, inclusive, with the annual Plant Maintenance & Engineering Conference set for the same week.

Exhibit space already assigned indicates that the show will be about 50% larger than the last time it was staked in Chicago. About 425 companies are expected to exhibit.

One of the important new aspects of both the show and the conference will be the presentation of methods and equipment to eliminate pollution of air and water, both within and outside plants. The pollution problem is one of the most troublesome to both industry itself and the communities where plants are located.

Advance registration and hotel information for executives who plan to attend may be obtained from Clapp & Poliak, Inc., New York, N. Y., the exposition management.

Detroit Rubber Course

The Detroit Rubber & Plastics Group recently announced minor changes in its educational program in cooperation with Wayne State University.

This year the introductory course will be offered in the fall semester only; the advanced course will be offered in the spring. Prior to this school year, each course has been offered every semester. DRPG Educational Committee Chairman R. W. Malcolmson, E. I. du Pont de Nemours & Co., Inc., explained that the change is being made because the backlog of interested applicants for the courses has now been caught up with. Indications are that a single offering of each course during the academic year will now serve the needs of the Detroit area.

In another change, S. M. Sidwell, of Chrysler Corp. was named instructor of the introductory course, replacing S. R. Schaffer, of U. S. Rubber, who has been transferred to that company's research center in New Jersey.

Refrigeration Show Planned

A $5-million display of air conditioning and refrigeration equipment, for stores, industrial plants, food processors, institutions, homes, offices, warehouses, common carriers, trucks, and automobiles will feature the tenth Air Conditioning & Refrigeration Exposition at Chicago in November.

The show, the largest and most comprehensive ever undertaken, will be held at the International Amphitheatre, November 18 to 21. Last held in Chicago six years ago, it is sponsored by the Air Conditioning & Refrigeration Institute, Washington, D. C.

A record-breaking number of participating companies, more than 250, will have on display some 7,500 pieces of equipment and components.

About 20,000 executives from a broad cross-section of industry are expected to attend, and, for the first time, the general public will be admitted on the last day of the show.

Controlled temperature is one of the key factors in industry today, said George S. Jones, Jr., managing director of the Institute. There is no industry in America which is not directly affected by the astonishing advances made in both air conditioning and commercial refrigeration. In terms of cost reduction, automation, quality control, maintenance, labor relations, marketing, and customer satisfaction, these two great processes are revolutionizing industry. No executive concerned with industrial production, retailing, transportation, warehousing, building, or institutional management can afford to miss this show.

A list of exhibiting companies is available on request to Banner & Greif, 369 Lexington Ave., New York 17, N. Y.

Joint Meeting in Texas

Plans for the November joint meeting of the Commercial Chemical Development Association-Chemical Market Research Association in Houston, Tex., are essentially complete, it has been announced by meeting co-chairmen, John D. McPherson, Jefferson Chemical Co., Inc., and K. A. Danskin, The Lubrizol Corp. The meeting, to be held at the Shamrock Hilton Hotel, November 20 and 21, will have as its overall theme "The Gulf Coast Chemical Industry in 1965—A Forecast."

The first technical sessions will deal with such subjects as economic factors favoring expansion of the chemical industry in the Gulf Coast area, a production forecast for sulfur and sulfur derivatives and production of chemicals from brine and sea water. Outstanding speakers from chemical and oil companies with Gulf Coast operations will be featured.

A second technical session will be concerned with forecasts for the Gulf Coast Petroleum industry in 1965—its internal consumption of hydrocarbons and availability of these raw materials for production of chemicals. A panel discussion by key men from companies producing ethylene, propylene, butylene, aromatics, and other chemicals will forecast prospects for such petrochemicals in 1965.

J. J. Allen

J. J. Allen Joins RW Editorial Board

J. J. Allen, chief chemist, Firestone Industrial Products Co. Division, Firestone Tire & Rubber Co., has joined the Editorial Advisory Board of RUBBER WORLD. Mr. Allen filled the vacancy created by the death of C. C. Davis.

Mr. Allen received his B.S. in chemical engineering from Case Institute of Technology in 1922 and his M.S. from the same institution in 1929. He also obtained a Chemical Engineering degree in 1931. He worked for the Mechanical Rubber Co., Cleveland, O., a former United States Rubber Co. subsidiary, from 1922 to 1927 as a rubber compounder. Mr. Allen has been with Firestone since 1927, first as a compounder in the Industrial Products Division until 1932 and then as chief chemist of that division from 1932 until 1939. He was chief chemist of the Firestone Latex Products Division from 1939 to 1949, returning as chief chemist as the Industrial Products Division in 1949, the position he now holds.

The new Board member belongs to the American Chemical Society and its Rubber Division, the American Society for Testing Materials and its Committee D-11 on Rubber Products, Alpha Chi Sigma, and the Masonic Order. He has been particularly active in Committee D-11 and is at present secretary of that group.

Mr. Allen will advise the editors of RUBBER WORLD in the industrial rubber products field where his long experience and knowledge will be extremely valuable.

Statement of RUBBER WORLD

Statement required by the Act of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946, (Title 39, United States Code, Section 233) showing the ownership, management, and circulation of RUBBER WORLD, published monthly at Philadelphia, Pa., for October, 1957.

1. The names and addresses of the publisher, editor, managing editor, and business manager are: publisher, B. Brittain Wilson, 386 Fourth Ave., New York 16, N. Y.; editor, Robert G. Seaman, 386 Fourth Ave., New York 16, N. Y.; managing editor, S. R. Hague, 386 Fourth Ave., New York 16, N. Y.; business manager, Paul Baumhart, 386 Fourth Ave., New York 16, N. Y.

2. The owner is: Bill Brothers Publishing Corp., Estate of Raymond Bill, Estate of Edward Lyman Bill, all at 386 Fourth Ave., New York 16, N. Y.

3. The known bondholders, mortgagees, and other security holders owning or holding 1% or more of total amount of bonds, mortgages, or other securities are: None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

B. BRITTAIN WILSON
Publisher

Sworn to and subscribed before me this 13th day of September, 1957.

[Seal] HELEN M. VERLIN

Notary Public in the State of New York, No. 31-9460500, Qualified in New York County.
(Commission expires March 30, 1958)

Boston Course Slated

Northeastern University, in cooperation with the Boston Rubber Group, will give a 15-lecture course, "Rubber Technology I," in basic compounding and processing of natural and synthetic rubbers at Northeastern University, Room 300, Richards Hall, Boston, Mass., each Monday from 7:00 to 9:00 p.m., September 30 to January 27, 1958.

The course will deal with common compounding ingredients, various elastomers, and basic processing techniques and equipment. Some attention will be given to test methods, quality control, etc. A course in rubber compounding practice (Rubber Technology II) is planned for the second semester, to start Monday, February 3.

Registration has been limited to the first 50 applications received. Instructing the course will be Robert Loveland, district representative, R. T. Vanderbilt Co., who has had 27 years' experience in the rubber industry.

Chicago Group Course

The Chicago Rubber Group will give a 25-lecture course, "The Basic Course in Rubber Compounding," at The John Marshall Law School, 315 S. Plymouth Court, Chicago, Ill., Tuesday nights, from October 1, 1957, to April 1, 1958.

Registration is limited to the first 50 applications received, according to John C. Gallagher, Chicago Allis Mfg. Corp., 113 N. Green St., Chicago. The tuition is $50.00, including the cost of textbook and field trips.

Harold Starck, Dryden Rubber Division, will again coordinate the course. Diplomas certifying satisfactory completion of the prescribed work will be awarded to those students qualifying, at the final meeting of the Chicago Rubber Group.

NEWS of the MONTH

Washington Report and Industry News Summary

. . . Plans for Labor Department tire industry wage probe revised. Industry had complained of such action to determine minimum wage coupled with general tire industry study as beyond scope of Walsh-Healey Act.

. . . Senate Small Business Committee probe of Federal Trade Commission with special reference to its actions in tire and tube marketing postponed until 1958.

. . . Footwear industry asks U. S. Tariff Commission for higher import duties on imported footwear. U. S. industry's future threatened by foreign products.

. . . National Science Foundation calls on advisory panel and research contractors for suggestions for 1958-59 high polymer research program.

. . . Justice Department asks for more information on The B. F. Goodrich Co.'s process for making synthetic polyisoprene.

. . . United States Rubber Co. dedicates multi-million dollar research center. Five-year $120-million research program planned.

Washington Report

By ROBERT E. L. ADAMSON

Government Begins Tire Industry Wage Probe Again; Industry Complaints Narrow Scope of Investigation

After a false start the Department of Labor began all over again last month on its controversial investigation of the minimum wage paid by the rubber tire industry. With a switch which caught everybody but the government by surprise, the Department cancelled all its plans on the eve of a wage canvass involving some 75 employers, including those manufacturing the camelback used by the tire retreading industry.

Under the Walsh-Healey Act, enacted during the late 1930 depression days, the Secretary of Labor is required to see that all firms holding government contracts of $10,000 or more pay their employes the "prevailing wage" in their particular industry. The Labor Department's Walsh-Healey Division had made a pass at the tire industry during the Korean War, but dropped the investigation proposed then. Earlier this year, however, the Department decided to go ahead with a tire industry probe, called in a labor-management panel for advice, worked out the scope of the study, and scheduled it for completion by mid-summer.

Industry Complaints

The industry representatives for management, officials of The Rubber Manufacturers Association, Inc., went along with the program, chiefly because they had little choice but to cooperate. They complained, however, of action under depression-type legislation during a period of unparalleled prosperity. Moreover, they were suspicious of the unique manner in which the study was set up. That is, the Walsh-Healey Division decided to couple its investigation with a general tire industry study already programmed by the Bureau of Labor Statistics. Division spokesmen said this was done for efficiency reasons, but management spokesmen feared it was an effort to get around the requirement that the scope of any Walsh-Healey investigation be cleared with the Bureau of the Budget, policy-arm of the White House.

This criticism of the dual-study program may have been the chief reason for its abandonment, although government sources said the original plan was dropped for practical difficulties within the Department. At any rate, the Division disclosed to RUBBER WORLD in September that a fresh start would be made as soon as possible, with the first step to be the recall of the labor-management panel. In the process the Division decided to shrink the scope of the investigation by not including manufacturers of camelback.

New Plans

Following preliminary discussions with the labor-management panel, the Division worked out the scope of the questionnaire to be submitted to tire manufacturers, a definition of the tire industry for Walsh-Healey purposes, the number of manufacturers to be canvassed, and the wage period to be used in determining the prevailing wage. The original pay period was to have been that ending on the date nearest May 22. Presumably, the new period will be a date some time this fall. The idea is to require all tire manufacturers covered by the program to reveal his wage payments during the pay period decided upon; then, from these reports, estimate the prevailing wage in the industry.

After the questionnaire is drawn up, it goes to the Budget Bureau and, if cleared, is sent to the manufacturers. The replies are worked over by the Walsh-Healey experts at Labor, and their finding is prepared in tentative form. The next step is a public hearing to which all interested parties are invited for comments on the tentative figure or figures. Final step is submission of the portfolio to the Secretary of Labor for his final decision.

If he ultimately issues an order declaring the prevailing wage for tire workers, every contractor filling government orders of $10,000 or more must pay the wage

to workers performing under the contract.

Labor has nothing to lose because the government's action will not affect wage gains already achieved, and it may serve to boost wages in some areas or in certain instances. Management contends, however, that labor has already done pretty well by itself, that the incentive system in widespread use in the tire industry does not lend itself to a minimum wage policy, and that the scores of rubber products manufactured by the employes of a tire manufacturer will present a confusing problem as to which employes are working under government tire contract and when.

No 1957 Probe of FTC and Tire Marketing; Emphasis in 1958 Will Be on Price Fixing

The Senate Small Business Committee disclosed in September that it would be unable to carry out this year the broad investigation of the Federal Trade Commission, the marketing of tires and tubes, it had planned to complete before Thanksgiving. At the same time, however, the Committee revealed that the emphasis of its public hearings, when held early in 1958, will probably shift from the FTC's prosecution (or failure thereof) of tire marketing complaints to alleged price fixing by unnamed major tire manufacturers.

Humphrey's Plans

Head man in the investigation is Senator Hubert H. Humphrey, live-wire Democrat from Minnesota. He will lead the probe as chairman of a small business subcommittee which specializes in investigation of marketing practices or malpractices affecting the small business world. His plan to schedule an early and short series of hearings on tires ran afoul of other plans to conduct a nationwide study of small business tax problems. This 13-city tour on taxes, coupled with the late adjournment of Congress, is chiefly responsible for the lengthy postponement of tire hearings.

His staff, having completed its groundwork for the hearings, has decided upon a tentative witness list which includes officials of FTC, the Department of Justice, executives of rubber tire manufacturers, retail and/or wholesalers of tires, and possible representatives of oil companies active in the "overriding commission" system of marketing tires, batteries, and accessories (TBA) through retail gasoline stations. In other words, the Humphrey subcommittee intends to conduct a broad tire marketing inquiry, with emphasis on every aspect of marketing in which FTC is or should be active. These include the overriding commission system, the quantity-limits discount rule thrown out by the federal courts a few months ago, tire advertising, and the new controversy—alleged price-fixing.

FTC Activity Status

The status of FTC activity in each of these areas follows:

• Three major cases challenging the legality of overriding commissions have been delayed by the illness of the presiding examiner handling all three. Commission attorneys predict flatly, however, that they will finish presenting all the evidence they have by the end of 1957. Then it will be up to the three rubber company and three oil company respondents to offer rebuttal and new evidence favorable to them. Respondents or "accused" are: The B. F. Goodrich Co. and Texas Co. in one case; Goodyear Tire & Rubber Co. and Atlantic Refining Co. in a second case; and Firestone Tire & Rubber Co. and Shell Oil Co. in the third. At issue is the legality of "overriding commissions" collected by the oil companies from the rubber manufacturers for marketing TBA items through gasoline stations handling the oil-company brands.

• FTC has not yet decided what to do about the spring decision of the Federal Appeals Court here rejecting the Commission's regulation limiting to 20,000 pounds (a rail-carload) the quantity on which tire and tube manufacturers may grant price discounts. The rule was thrown out as failing to comply with the law, but the Court left the door open to a rewriting of the rule to bring it into compliance. The Commission is still debating, however, whether to accept this implied offer, or start all over again to determine whether a rule is necessary, or drop the whole thing.

• As RUBBER WORLD went to press, the Commission was still studying an interim program to clear the air on tire advertising. Strong interests among both dealers and manufacturers are supporting federal intervention against purported misrepresentations in tire advertisements, but a final decision of the Commission had still to be handed down. The agency was expected, however, to set up a trade practices program aimed at getting voluntary industry cooperation with a specific set of marketing rules.

• The Commission is engaged in a supposedly secret investigation of possible price-fixing violations by undisclosed tire manufacturers. Congressional sources confirmed that the FTC probe is under way, but Commission spokesmen were mum on the details.

FTC Ineffective?

The entire FTC record in the tire field—past and present—will be aired publicly if and when Senator Humphrey schedules his hearings. His chief aim is to show that the Commission has been generally ineffective in dealing with alleged malpractices in the industry, and, if so, he wants to know why.

Footwear Industry Asks Return to Higher Tariffs; Claims Future Threatened by Foreign Competition

Seventeen manufacturers of rubber footwear, producing "virtually 100% of the rubber footwear made in the United States," went to the U. S. Tariff Commission in September for a greater measure of protection from foreign imports. The petition, though a surprise to the foreign trade experts, was another factor in the growing trend toward "protectionism" and away from "free trade."

It was filed by Bata Shoe Co., Inc., Bristol Mfg. Corp., Cambridge Rubber Co., Converse Rubber Co., Endicott Johnson Corp., Goodyear Footwear Corp., Goodyear Rubber Co., Hood Rubber Co. (Division of B. F. Goodrich Footwear Co.), LaCrosse Rubber Mills Co., Mishawaka Rubber & Woolen Mfg. Co., Randolph Mfg. Co., Rubber Corp. of California, Servus Rubber Co., So-Lo Marx Rubber Co., Tingley Rubber Corp., Tyer Rubber Co., and United States Rubber Co.

1930 Rates Requested

These companies asked the Tariff Commission to restore duties on rubber footwear which were cut in the wave of trade concessions negotiated by free-world countries after World War II. Commission approval would boost the duty on waterproof rubber footwear from 12½ to 25% of the American selling price, and on rubber-soled fabric-upper footwear from 20 to 35% of the American selling price. These reductions, the manufacturers said, were granted at world trade conferences in Geneva in 1947 and 1955. Withdrawal of the concessions would return the duties for the two types of footwear to the rates established under the Tariff Act of 1930—25 and 35%, respectively.

"The American rubber footwear industry," the Commission was told, "stands in relatively the same position now as it did in 1932 when it asked (you) to investigate the threat it was under from rapidly rising importations of competitive footwear. As a result of your investigation these products were put under the American selling price provision by presidential proclamation on February 4, 1933.

"The tariff concessions (granted since) have greatly diminished the effectiveness of this action. Today the American rubber footwear industry is seriously threatened by imports that have been rising steadily since postwar adjustments were made in world trade."

Foreign Competition Severe

How bad and where is this foreign competition? The manufacturers say it is substantial, is growing worse, and is concentrated in a limited range of styles and sizes where "the impact on the domestic market is far greater than the reported pairage of imports indicates.

"Furthermore," they complain, "over the past few years hundreds of thousands of rubber footwear have been imported which do not appear in official import figures. By resorting to a subterfuge to escape being assessed for duty under the American selling price, importers have succeeded in having their imports classified as leather-soled shoes, in one instance, and footwear with uppers in chief value of leather, in another."

Including these "unofficial" imports, the 17 said, their figures show an upward trend in imports between 1951 and 1955 and a sharp increase in 1956 in each of the government's rubber footwear categories—rubber boots, rubber shoes and overshoes, and rubber-soled fabric footwear. The official figures, it was noted, also point up the fact "that imports of rubber footwear have been increasing at an alarming rate since 1951." The petitioners estimated these increases at 380% in rubber boot imports, 800% for shoes and overshoes, and 500% for rubber-soled fabric footwear.

"The fact that imports fall into a few types, further limited as to sizes and genders," the pleaders commented, "may seem to indicate that the competition could not be too severe on the domestic industry, which produces hundreds of different types of rubber footwear. On the contrary, it is because of the concentration of imports on a few items that the domestic industry is particularly vulnerable.

"The foreign producer copies the design of the American manufacturer and injects his product into a market in which the American manufacturer has spent considerable money and effort to create a demand for the particular item of footwear.

"The importer invades the field in the area of greatest popularity as to type, style, size, and gender. A relatively small amount of imports thus pinpointed can determine the price schedule for the whole line.

"But the damage does not end here. The domestic manufacturer cannot make adjustments only at the point of attack. An adjustment in one line could upset the entire price schedule of the industry. This is true not only in rubber footwear, but in all businesses. You can't cut porterhouse steaks to 20¢ a pound, and expect to hold chuck at 65¢."

Industry's Future Threatened

The companies listed three specific items of footwear in the U. S. market—from France, Japan, and Hong Kong—to dramatize the cost advantage enjoyed by foreign manufacturers. On each of these, the price to the American consumer was about half the price for which the American counterpart is sold. The chief reason, it was contended, is the lower cost of labor. Some 50% of American footwear manufacturing costs are represented by wages, the petition stated, and workers in foreign plants receive as low as 10% of wages paid footwear workers here.

Moreover, it was stressed, each skilled employe turned out of an American factory reduces the number of people available to meet a defense effort.

"Whether they can find other gainful employment is problematical," the manufacturers conceded. "But this is a certainty —unless the American rubber footwear industry can continue to recruit young men and women to be trained to replace those that old age takes out of service, and unless the industry can provide continuous employment for their people these skills will be lost.

"The effects of such an eventuality would reach far beyond the rubber footwear industry, its stockholders and its employes. In addition to the millions of pairs of health-protective and health-developing footwear the industry provides for the general public, it was called upon during World War II to make more than 45,000,000 pairs of rubber footwear for the Armed Forces.

"Many other war products also were made in rubber footwear plants. Among the most important were pontoons and life rafts. In fabricating these items the rubber footwear workers employed the special skills they had developed in making rubber footwear—building up the various pieces of fabric and coated fabric into the finished article. Rubber footwear workers were among the very few with the skill and know-how required to produce these materials of war.

"Today, many rubber footwear plants are working in close cooperation with military agencies in developing and producing special-type footwear demanded in the maintenance and advancement of national defense. New machines and new methods of war, creating new conditions under which men must live and fight, have put increased demands on the rubber footwear industry, as well as other industries, to provide new equipment and apparel so these fighting men can do their job.

"The rubber footwear cannot long continue to render this service if it is left exposed to the paralyzing effects of competition from low-wage foreign producers."

The petitioners estimated there were some 20,000 men and women employed by the industry, most of them in the 25 plants operated by the 17 firms seeking relief. Both the jobs and the financial investments behind them, the companies declared, "are seriously threatened because our government has drastically reduced the import duties of" rubber footwear.

NSF Begins Planning 1958-59 High Polymer Research; Calls on Advisory Panel and Contractors for Advice

The National Science Foundation, its advisory panel on high polymer research, and the universities holding high polymer research grants from NSF will sit down together next month to decide the future course of the work in this field. The Foundation, no longer in the synthetic rubber research field, per se, is a driving force in this country's basic research effort on high polymers. As such, it issued a series of two-year grants more than a year ago to carry high polymer work through 1957 and into 1958. With these grants slated to run out some time next year, NSF's chemistry director, Walter F. Kirner, wants to work out the 1958-59 program now.

NSF Advisory Panel

He therefore has scheduled a several-day conference here in November to which all grant holders are invited. Also attending the preliminary meetings, then meeting on its own, will be the seven-man advisory panel on high polymer research. This group will recommend the new course to be charted after hearing what the present grant holders have to suggest. As an NSF spokesman put it:

"The eleven universities and the National Bureau of Standards will present their cases (for continued research): then in the next day or two the panel will have to decide where it is going in the future."

Advisory panels rank high in the NSF table-of-operations, since they are picked by the government as 6-12 of the best minds and most capable men in their fields. In the case of high polymers, NSF has gathered these seven men: John H. Dillon, director of the Textile Research Institute, Princeton; John D. Ferry, department of chemistry, University of Wisconsin; Paul J. Flory, department of chemistry, Cornell University; Frank R. Mayo, Stanford Research Institute; Therald Moeller, department of chemistry, University of Illinois; Carl C. Monrad, department of chemical engineering, Carnegie Institute of Technology; and Charles G. Overberger, head of the chemistry department, Polytechnic Institute of Brooklyn.

Present Polymer Research

NSF spent $687,000 during the fiscal year just ended—June 30—in the general area of molecular structure and the arrangement, composition, and properties of high polymers and their methods of preparation. A similar amount is being spent in the fiscal year which ends June 30, 1958.

The program marked a sharp turn by NSF away from its more or less applied research program on synthetic rubber. When the government moved to sell out its synthetic rubber production plants in 1955, the natural result was a swing away from synthetic rubber research of this type. If private industry was taking over the production of synthetic, it was decided, it should assume the responsibility for research.

Some synthetic rubber research is still sponsored by the National Bureau of Standards and the Department of Defense (items such as heavy-duty aircraft and truck tires needed to maintain the defense posture), but the trend has been away from applied research on synthetic to basic research on high polymers. The present grant-holders and the problems they are investigating include:

University of Akron, mechanism of the heterogeneous addition polymerization; Case Institute, rheology of suspensions of spherical particles and of polymer solutions; University of Chicago, chemistry of polymerization and the chemical properties of polymers; Cornell, polymers in strong electrical fields and porous media flows, plus properties of polymers and their solutions; University of Illinois, synthesis and relation between structure of high polymers, plus mechanics of coiling-type polymer molecules; MIT, polymerization and polymers produced by organo-alkali metal reagents; Mellon Institute, physical properties and molecular parameters of polymers; University of Min-

nesota, kinetics and mechanism of emulsion polymerization; NBS, rheology and thermodynamics of polymers.

Also, Johns Hopkins University, chemistry of the condensed phosphates; New York University, stereoisomerism of vinyl polymers, plus polymerizations initiated by electron-transfer to monomer; and University of Wisconsin, mechanical properties and polymer structure. Third grants are also held by Cornell (synthesis and characterization of inorganic polymers) and Illinois (phosphorus-nitrogen compounds and their derivatives.).

The present program provides for the full-time participation of 32 scientists and half-time participation of another 30. This compares with the 49 full-time and 41 half-time people employed by the government under synthetic rubber research contracts.

Future Program

The scope of the new program might possibly be announced later this year, but, more probably, will be held back by the Foundation until it presents the "tab" to Congress early next year. As in the case of every government agency, NSF will have to request the appropriations to fund the program after it has worked out the estimated cost.

Information on Ameripol SN Asked of Goodrich by Justice

The Department of Justice moved in September to fill out its case against The B. F. Goodrich Co., inventor of a secret process for duplicating the natural rubber molecule—Ameripol SN rubber. Justice approached Goodrich for information "only Goodrich can provide" after the company had filed a formal reply rebuffing the government's right to sue for the Ameripol process.

The federal suit, filed in May, accused Goodrich of illegally retaining process data to which the government said it was entitled under research contracts held by Goodrich between 1949 and 1955. The contracts ostensibly required all companies doing synthetic rubber research for the government to relinquish all information on synthetic developed by the contractors or its subsidiaries "regardless of whether such information resulted from research paid for by the government."

It was this provision extending contract coverage beyond work done specifically for the government that appears to have led to the suit. This became apparent when Goodrich's attorneys told the Federal District Court here that the research contracts relied upon by the Justice Department in its suit contained provisions "which are beyond the authority conferred by law" upon the Reconstruction Finance Corp., the government's contract signatory.

In effect, Goodrich admitted that such contracts had been drawn up and signed by RFC and the company, and that it had discovered and developed the Ameripol process. But the company argued that the contracts were illegally drawn in requiring Goodrich or its subsidiaries to divulge the details of all synthetic rubber developments during the six-year period when the company was participating in the synthetic rubber research program.

Government attorneys disclosed they had followed up the Goodrich reply to the government suit by requesting the company to "admit certain facts" and permit the Department of Justice to examine company files "as to the nature of their (Goodrich's) research on this process as a preliminary step to getting what we might want to use as evidence." A rejection of the request by Goodrich would require a court hearing, and, assuming the request was approved by the court, the government would proceed to build its case.

The Ameripol process is patented by Goodrich-Gulf Chemicals, a joint operation owned 50% by Goodrich and 50% by Gulf Oil Corp. Goodrich-Gulf, according to the parent rubber firm, made the discovery after buying scientific knowledge in Europe in 1954. Nevertheless the government seeks all information touching on the process, plus a royalty-free license to use the process.

Justice Department officials said they were prepared for a lengthy court fight, in view of Goodrich's position. They predicted that the case would go well into 1958 before any decision could be handed down by the District Court for the District of Columbia. It was a foregone conclusion that any decision would be appealed to the U. S. Supreme Court by the losing party.

NBS Quits Calibration Of Viscometers

Effective January 1, 1958, the National Bureau of Standards, Washington, D. C., will discontinue calibration of viscometers. This action is in line with the government's general policy of withdrawing from activities that can be carried on by private industry. This decision will permit the Bureau to devote more of its resources toward meeting the demands of science and industry for new and more accurate standards.

Most users of viscometers now carry out the calibrations in their own laboratories, using viscosity standards available from NBS, American Petroleum Institute, or elsewhere. Calibration by the user has the advantage that the effects of any slight peculiarities of operating techniques and accessory equipment tend to cancel out when they are the same for both the calibration and the measurements on unknowns.

Of the many types of viscometers in use, only a few have been calibrated by the Bureau. In recent years these have included only the Saybolt, the Modified Ostwald, and the suspended level types. In 1956, calibration of Saybolt viscometers was discontinued as a logical result of the abandonment of the Master Saybolt viscometers as standards. Requests for calibration of the glass capillary tube instruments have been limited almost entirely to the Modified Ostwald (Fenske or Cannon-Fenske) instruments, and there has been little demand for this service in the last few years.

Industry News

U. S. Rubber Shows New Research Center and Products; Five-Year $120-Million Research Program Planned

New tires for the future, a giant rubber fabric container which may revolutionize liquid cargo transportation, an improved butyl rubber compound, and a major step toward the development of a plastic hot water pipe were among the developments announced by United States Rubber Co. at a preview for the press of its new research center at Wayne Township, N. J., on September 17.

This Wayne Township location is the fourth one for the central research laboratories of U. S. Rubber. The original laboratory was founded in New Brunswick, N. J., in 1912; it moved to New York in 1913 and to Passaic, N. J., in 1928.

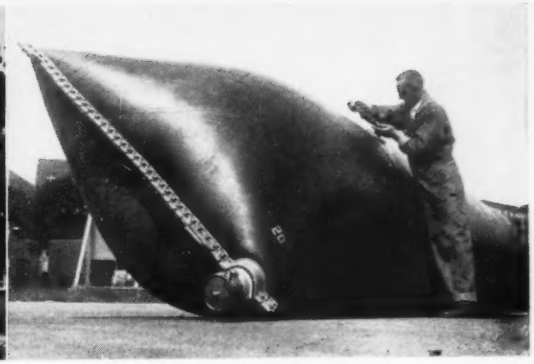
Ground was broken for the new research center in May, 1955, and the occupancy at the new location began in February of this year. The 99-acre tract is about five miles from Paterson, N. J., and about 25 miles from New York, N. Y. Four main buildings comprise the research center, supported by a power house and a modern waste treatment plant.

Building Details

The main research building is of three-story brick construction with a total area of 114,100 square feet. It houses 48 unit laboratories as well as special laboratories devoted to analytical, textile, and photographic work. It has 17 offices, three conference rooms, cafeteria, hospital, stockroom, and a library containing 8,500 books, scientific journals, and a file of 58,000 United States and foreign patents.

The engineering research building is of two-story brick construction with a total

Main research building at the new research center of United States Rubber Co., Wayne Township, N. J.



Sealdtank of 3,800-gallon capacity for use by the trucking industry

area of 45,240 square feet. It has completely equipped maintenance shops, machine shop, carpenters' shop, physical testing laboratory, mill room for rubber and plastics, mechanical engineering laboratory, and a radiation laboratory equipped with a 2,000,000-volt Van de Graaff electron accelerator.

The chemical engineering building contains a total area of 13,790 square feet and is equipped with reactors for the polymerization of synthetic rubbers and plastics ranging in size from five to 100 gallons. This building also contains vacuum, spray, and rotary kiln driers, centrifuges, and various filters.

There is also a greenhouse with a total area of 5,040 square feet where more than 300 rubber trees are being grown at present. Temperature is maintained at 85° F. and humidity at 40% in connection with experimental work concerned with nutrition and aimed at increasing the yield of natural rubber trees grown on company plantations in Malaya and Sumatra.

Research Objectives

U. S. Rubber plans to spend a minimum of $120 million on research and development over the next five years, H. E. Humphreys Jr., president, announced at a luncheon at the North Jersey Country Club.

This spending for research and development is part of a five-year program of expanded effort at the research center and at the company's laboratories at 22 locations, including plants in this country and Canada and plantations in the Far East.

Mr. Humphreys named three main objectives in spending this $120 million, one of which is to develop passenger-car tires of such superior quality that they will give entirely safe, trouble-free performance at turnpike speeds and permit elimination of the spare tire on both new and used cars.

Three experimental tires of the future, all made of different materials, were unveiled. At the same time, the rubber company predicted that low-profile tires will be standard equipment on all 1959 autos.

One of the experimental tires, which gives 200% more mileage than tires now in use, is made of Vibrathane, a polyurethane rubber. Another, made of improved butyl rubber, makes a low-priced car ride more luxurious.

The third is an airplane tire made of silicone rubber and reinforced with wire instead of textile cord. This tire is farthest from the everyday world of the motorist and was developed as a joint research effort of U. S. Rubber and Dow Corning Corp. This tire can withstand sustained temperatures up to 500° F.

Mr. Humphreys said another main objective is to bridge the gap between rubber and metals and that his company is working on a whole new list of rubber types and plastics types, as well as blends of the two. A superior blend of rubber and plastic called Kralastic HTHT and used in new plastic pipe was described as stronger than previous types and, in addition, able to withstand the higher temperatures required in many uses both in home and in industry.

The third objective mentioned was to unlock the wealth of atomic energy as it applies to the rubber industry. New materials, including rubber and plastics, and entirely new processes in which atomic energy does the work of heat, pressure, catalysts, and chemicals, were predicted from the use of atomic energy.

"Those are our main objectives over the next five years," Mr. Humphreys declared. "In this research center we can already see far enough ahead to know that we are on the verge of a new era in the rubber industry."

The Sealdtank

The giant rubber-fabric container called the Sealdtank was shown publicly for the first time at the press preview of the new research center. One version of the Sealdtank is 56 inches in diameter, 35 feet long, and holds 3,800 gallons of liquid. It weighs 1,040 pounds empty and its capacity, when filled with molasses, for example, is 22 tons. When empty, the Sealdtank lies flat and can be rolled into a compact, cylindrical package 25 inches in diameter and seven feet four inches in length.

Placed empty on a trailer truck, it can be filled through a fitting at one end or from the top with whatever liquid is to be transported. Atmospheric pressure collapses the tank as it is emptied at journey's end.

The Sealdtank is made of four plies of rubber-coated rayon tire fabric. Both ends are sealed by metal closures resembling spinal columns, and its outer surface is made of neoprene for oil and weather resistance.

The inner surface can be made of any of a variety of special rubber compounds which make possible the handling of almost any type of liquid including some highly corrosive chemicals. A polyethylene bag can be used as a liner for the tank for handling edible liquids.

The Sealdtank can be made in any size to fit any truck, railroad car, barge, or ship. In addition to the 3,800-gallon container for trucks the company plans to manufacture a 6,500-gallon size for the railroad industry and 10,000- and 20,000-gallon sizes for barges and industrial plant storage.

Improved Butyl Compound

A new butyl rubber compound called HBT is being utilized by U. S. Rubber in the production of conveyor belts, hose, and a variety of molded products. This compound is also being evaluated as a possible tire rubber and for other automotive uses. The compound, as such, is not being sold by the company.

HBT will withstand a sustained temperature of 400° F. and a peak load of more than 700° F. for short periods of time, it was said. Satisfactory heat-resistance characteristics for natural rubber end at 250° F., for SBR at 275° F., and for regular butyl rubber compounds at 300° F. HBT is believed to be the best and most economical heat-resistant rubber compound currently available, according to the U. S. Rubber research men.

More than 50 conveyor belts for carrying hot materials have been produced and placed in test installations throughout the country. The compound shows promise for wire-braid super-heat steam hose for service at temperatures from 400 to 450° F., for gaskets, seals, diaphragms, and a variety of other molded rubber products for high temperature service.

New Product Exhibit

At one of the conference rooms in the main research building an exhibit of many of the company's new products in the fabric, yarn, tire, mechanical and other rubber goods, and plastics fields were on display.

Brief talks were made by Sidney M. Cadwell, director of research and development; Leland M. White, assistant director

of research and development; and Arthur E. Brooks, manager of the research center.

It was emphasized that the research and development work at the research center is aimed not only at developing improved new rubbers, plastics, and textiles, but to use these materials either alone or in combination to best advantage.

Electronic Proportioning

A glimpse into the future of electronic proportioning is now being offered to visitors of Richardson Scale Co., Clifton, N. J., by means of a permanent exhibit of the company's Select-O-Weigh system, installed to operate as an integral unit with either a Boss Board method of programming or Punched Card Reader (PCR) Control.

Said to be many years in advance of present-day batch proportioning systems, the new exhibit incorporates a complete electronically controlled system in which simulated bulk materials are handled automatically from supply bins through mixing operations. Operation of the materials handling and weighing system is graphically demonstrated by a large lighted panel showing in color a simplified arrangement of storage bins, feeders, scale, mixer and take-away conveyor.

An outstanding feature of the exhibit is the company's new Boss Board Control, which provides complete automation for the programming of proportioning and mixing operations. Exhibited publicly for the first time this year, the equipment functions by simply fitting into place a Boss Board containing formula settings for a multi-batch proportioning operation.

Automatic program control is also possible through the punched-card method, which makes use of handy punched cards previously coded for prescribed batching formulae. This method assures both high speed and accuracy of batch weighing and proportioning. The system goes into automatic operation the moment an operator inserts one of these cards into a Richardson PCR unit and presses a start button.

Also exhibited is a Select-O-Weigh control panel with four vernier weight selectors which provides another method of program control. With this type of panel, formulation is controlled by an operator who sets up on the selector dials prescribed weights of ingredients going into a formulated batch. The panel also contains a scale dial which indicates the weights of various materials going into the scale.

The system includes inventory counters for recording weights of each ingredient going into a batch and a totalizer for recording the accumulated weight of all batches. Also exhibited is a tape printer that keeps a permanent record of the materials selected and their individual and cumulative weighings in the batching operations.

General Tire's Genthane-S

The General Tire & Rubber Co., Akron, O., recently announced the development and pilot-plant production of a new synthetic rubber which has been designated Genthane-S.

Genthane-S is a polyurethane elastomer, which, according to General, is completely oil and ozone resistant. Compounds of Genthane-S are also reported to be highly resistant to abrasion.

While the usual rubber fillers may be used in Genthane-S, care must be taken to see that absorbed moisture is not introduced into the stock. This point is especially important when clays and silica are used. The carbon blacks, Hi-Sil, and Valron act as reinforcing pigments.

There are no unusual processing difficulties although considerable heat is developed during mixing. The use of 0.20 PHR stearic acid is suggested as a lubricant.

The recommended curing agent is dicumyl peroxide. Stocks are non-scorching and can be stored for months after extruding, calendering, or milling. The best curing method is by compression molding. Open steam cures have been accomplished, but they tend to degrade the vulcanizate.

A typical Genthane-S recipe and the properties of the corresponding vulcanizate are given below:

RECIPE

	PHR
Genthane-S	100.00
Stearic acid	0.20
Philblack A	25.00
Dicumyl peroxide	1.60
	126.80

Cure: 30 minutes at 320° F.

PHYSICAL PROPERTIES

300% modulus	1520 psi.
Tensile	3630 psi.
Elongation	590%
Shore A durometer	66
Goodrich flexometer	
Static compression	12% at 142 psi. load
ΔT	54° F
Set	6.6%
DeMattia flexes to 1/2" crack	30,000
Goodyear-Healy rebound	70.1%
Dynamic modulus	1184 psi.
Brittle point	below −73° C.
Gum ML-4 (212° F.)	50
Compound ML-4 (212° F.)	80

Merritt M. Goff

General Tire has prepared a booklet GT-1, titled "Genthane-S," giving more information about this new elastomer.

Form Radiation Firm

A new company specializing in an increasingly important segment of the atomic energy industry has been organized in Cambridge, Mass., under the name of Controls for Radiation, Inc. The announcement was made by the firm's president, William E. Barbour, Jr., founder and former president and chairman of Tracerlab, Inc.

Other principal officers of the new firm are Irving A. Berstein, vice president and technical director, and Edward A. DeCrosta, vice president in charge of sales.

The company will provide a comprehensive "package" service covering the broad radiation safety and hazards control aspects of the nuclear industry which are encountered by nuclear reactor operators, fuel fabricators, reprocessors of uranium fuels, users of radioactive materials and particle accelerators, and radioactive waste disposal groups.

Polymer Scholarships

Polymer Corp., Ltd., Sarnia, Ont., Canada, has named the winners of the 1957 scholarship awards. This year two university scholarships are provided for families of Polymer employes, one university scholarship is awarded to a student from Lambton County, and a fourth scholarship given to a 1957 university graduate, resident in Ontario, for training as a mathematics/science teacher at the Ontario College of Education. The Lambton County scholarship represents an addition to the scholarship which Polymer initiated in 1956.

Goff on RW Staff

New technical editor of RUBBER WORLD is Merritt M. Goff, most recently (and since 1955) a research assistant in the Department of Experimental Statistics, North Carolina State College. His previous technical experience had been gained in the research laboratory of The B. F. Goodrich Co. (1943-1948); as an instructor of engineering materials at Purdue University (1948-1950); and as a research rubber compounder in the research laboratory of The Goodyear Tire & Rubber Co. (1950-1955).

Mr. Goff was educated at Purdue and North Carolina State College. He received his B.Sc. in chemical engineering from the former in 1943.

He belongs to the American Chemical Society and its Division of Rubber Chemistry, the Institution of the Rubber Industry (London, England), the Catalyst Club, Tau Beta Pi, Phi Lambda Upsilon, and Omega Chi Epsilon.

Our technical editor was born in Boylesston, Ind., January 2, 1921. He is married and has one son.

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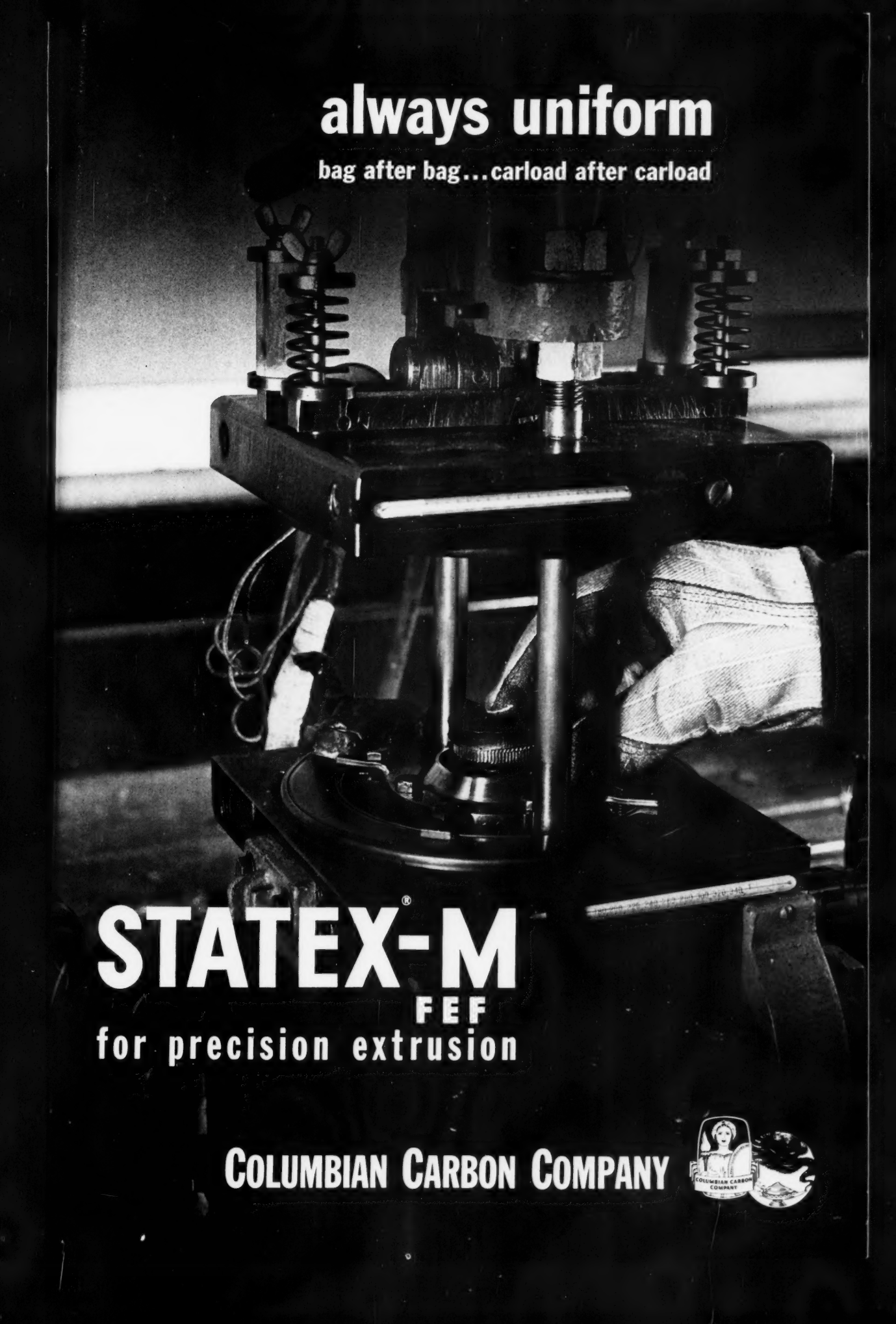
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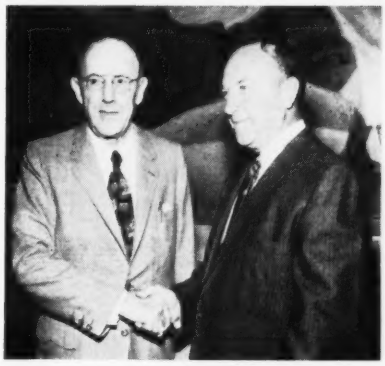
380 Madison Avenue, New York 17, N. Y.

Christie New Dayton Rubber Co. President

Clowes M. Christie, president of American Latex Products Corp. and Pacific Polymers, both of Hawthorne, Calif., has been elected president of The Dayton Rubber Co., Dayton, O. He succeeds A. L. Freedlander, Dayton president since 1936, who was elected chairman of the board to continue as a full-time officer directing company expansion, development of new products, and acquisition of subsidiary business organizations.

At the meeting P. J. Mayle, vice president and assistant secretary, was elected to the newly created office of executive vice president. Irving Eisbrouch, vice president in charge of tire sales, was promoted to vice president and general manager in charge of the tire division. L. V. Baker, treasurer, continues in that post and was elected to vice president in charge of finance.

Mr. Freedlander, in announcing the changes, stressed the rapid growth of Dayton Rubber and the increased work load. He reported that there have been increasingly heavy demands on management as the company has entered into new, highly dynamic fields such as foam rubber, plastics, polyurethanes, chemicals, and the application of these materials. He also announced that the company will continue to expand its business in its established line of products, such as mechanical goods, tires, textile products, rollers, and others. Dayton Rubber has increased its sales in the past 15 years from an annual volume of $14,000,000 to one approaching $100,000,000.



Clowes M. Christie *(right)* is congratulated by A. L. Freedlander upon Christie's election as Dayton Rubber president

In June, 1946, C. M. Christie formed American Latex Products Corp. to manufacture and fabricate foam rubber, and in 1951, because of high excess profit taxes, he sold American Latex to Dayton Rubber, became one of its largest stockholders and in the first year under Dayton ownership, raised gross sales of American Latex to more than $6,000,000. Today net sales total nearly $10,000,000 per year.

Propose Standard Size and Contour Foam Cushions

Pitt B. Harris, general sales manager, foam products division, Hewitt-Robins, Inc., Stamford, Conn., in a talk before a meeting of the National Furniture Manufacturers in Chicago, Ill., August 27, suggested for consideration the possibilities of standardization of design in foam latex cushions, the type used in padding upholstered furniture. He proposes a standardization program for the latex foam cushion industry involving six factors: (1) front to back dimension, (2) side to side dimension, (3) crown, (4) box, (5) contour, and (6) shape.

Harris said he would like to eliminate the $^{15}/_{16}$-, the $^{3}/_{8}$-, the $^{7}/_{16}$-, and the $^{15}/_{32}$-inch cushion dimensions. He suggested that the even inch dimensions in certain sizes and half-inch dimensions in other sizes be kept.

He proposed that standards would be based on the popular 5⅛-inch and 4¼-inch crown sizes, which would be made an industry-wide standard that would include flares on the corners to insure good tailoring and make it easier for designers to plan furniture that could be produced with less time and labor.

He said because of presently existing variables, one cannot mix cushions from two manufacturers. The same situation prevails in the thinner cushions as well. For the furniture manufacturer this situation borders on the chaotic, and for the foam rubber industry it means keeping an inventory of more than 7,000 molds—when a few hundred would do the job as well

Harris found four measurable advantages in the adoption of some sort of standardization in foam rubber cushions:

(1) Complete interchangeability of cushions from any manufacturer.

(2) Faster delivery of cushions because the manufacturers could reduce their staggering inventory of molds and devote their time to making more standard cushions and fewer special cushions.

(3) Greater design potential will be possible as standard contours evolve into the availability of more shapes from more manufacturers.

(4) Increased production through simplification effected throughout cushion departments. Standard contours mean easier and faster cover cutting, better and faster tailoring, and reduction in the number of tailoring complaints.

In summary, Harris in his final proposal suggested the following:

A committee within the foam rubber industry has probed into this business of standardization and has come up with some solutions that concern two principles: (1) size and (2) contour in the popular 5⅛-inch crown cushion and the 4¼-inch crown. It is suggested that the number of completely different contours in the 5⅛-inch crown be reduced from 12 to one and in the 4¼-inch crown from nine to one. In short, in these two basic size crowns, the number of contours classified as standard would be cut from 21 to two.

With respect to cushion sizes, the committee proposes to eliminate the infinite number of fractional sizes in cushions of under 21 inches. Between the 21-inch and 25-inch dimensions it is suggested that all dimensional increments other than ½-inch be eliminated, and in the 25-inch and up sizes, increments be confined to one inch.

On cushion ears, stated Harris, it is proposed that size dimensions be limited to variances of ¼-inch.

A standard flare, a standard rear contour and standard corners were also suggested.

Nylon Cord Unit

One of the largest nylon heat-treating units in the world has been installed at the headquarters plant of The Firestone Tire & Rubber Co., Akron, O. The unit is designed to give nylon cord special characteristics for the production of extra-high-quality tires.

Some of the largest rolls of cord fabric ever made—containing up to 5,000 miles of cord—are placed on the let-off stands at the start of the unit. Automatic roll changing and fabric splicing equipment allows the machine to operate continuously.

Standard 55-inch widths of fabric, containing as many as 2,000 cords, pass through the unit at the rate of 60 yards a minute. As the cords travel through the machine they are impregnated with a chemical "gum-dipping" solution, then stretched and tempered in a bank of powerful water-cooled tension rolls and high temperature, gas-fired ovens.

More than 90 feet tall, the unit contains 20 fans, 16 heaters, and 14 drive motors. Tension of 30,000 pounds is applied to the cords, which are subjected to 450 degree temperatures.

International Congress

International aspects of the rubber situation will be discussed at the international congress of the Societe de Chimie Industrielle in Athens, Greece, September 19, by Ray P. Dinsmore, vice president in charge of research and development for The Goodyear Tire & Rubber Co., Akron, O.

In his presentation Dr. Dinsmore, president elect of the American Section of the Societe, will point out the approaching critical shortage of natural rubber needed for larger tires of the truck and earthmover types unless countries outside the United States use a higher percentage of synthetic rubbers. He will also emphasize the need of developing a good natural rubber substitute which can be made available in adequate quantities at an economical price to augment natural rubber supplies.

A French industrial chemical organization with headquarters in Paris, Societe de Chimie Industrielle is international in scope, maintaining affiliated sections in many countries of the world. The American Section has headquarters in New York, N. Y.

Approximately 1,000 scientists and chemists from all over the world are expected to attend the society's gathering in Athens from September 17 through 23.

New Bonding Process for Polyethylene to Rubber And Metals Announced by Bell Laboratories

Bell Telephone Laboratories, New York, N. Y., have announced the discovery of a new adhesive system for bonding polyethylene and polyethylene-type plastics directly to rubber, brass, or brass-plated metals.

The adhesive, developed by Henry Peters, of Bell Labs, has peel strengths of up to 100 pounds per inch and tensile strengths of 1,000 pounds per square inch.

The adhesive is based on a partially hydrogenated polybutadiene, commercially known as Hydropol, manufactured by Phillips Petroleum Co., Bartlesville, Okla. The degree of unsaturation of the polybutadiene appears to be not too critical; but values between 3% and 30% unsaturation give the best bonds. Hydropol, however, is capable of vulcanization.

The Hydropol adhesive system, as formulated by Mr. Peters, is capable of bonding polyethylene (or plastics belonging to the polyethylene family) to such synthetic elastomers as neoprene and the SBR group as well as natural rubber. It is postulated that adhesion occurs between Hydropol and polyethylene because of their similar chemical character. On the other hand, it seems reasonable to assume that bonding takes place between Hydropol and the vulcanizable rubber by the formation of sulfur cross-links at the interface. In the case of direct polyethylene to metal bonds, the metal must be brass plated, and the bonding mechanism is probably of the same nature as that of the usual rubber-to-brass bond.

A layer of adhesive only two to three mils thick is all that is required for a good bond. The Bell adhesive may be made up in a solution and sprayed, brushed, or dipped on to the surface to be bonded. Alternatively, a thin layer may be fabricated of the adhesive and inserted between the materials to be bonded. No details have been given concerning the stability of the adhesive or the effect (if any) of atmospheric water vapor on the bonding process.

At present Bell's main interest in the Hydropol adhesive system is the bonding of insulation to conductors in plastic "drop wire" (used to extend telephone service from the line to the home), the bonding of polyethylene to brass in submarine cable amplifiers, and the production of waterproof submarine cable.

The chemical industry will undoubtedly find a score or more uses for the process, among which will certainly be tank linings, coating plating racks, lining containers for rocket fuel, and general corrosion prevention.

Tire Test Proving Ground Planned

A multi-million-dollar tire test proving ground will be built by The Goodyear Tire & Rubber Co. at San Angelo, Tex. The facility, to be one of the largest of its kind in the rubber industry, will include a banked five-mile high-speed circle, a meandering 20-mile paved figure-eight turnpike road, a 2½-mile tractor tire straightaway, a five-mile wandering gravel road, and headquarter buildings. The circle will accommodate speeds to 160 miles per hour.

The test site, a trapezoid in shape, covers 7,300 acres of rolling ranchland situated 14 miles northeast of San Angelo on the former Crownest Ranch.

Construction will culminate five months of engineering study and three years of planning by Goodyear's tire development department. Current planning calls for the five-mile test circle to be built first, followed by the headquarter buildings, 20-mile turnpike road, farm tire straightaway and gravel road, in that order.

The test circle, designed for speeds up to 140 miles per hour without side force and capable of handling runs up to 160 mph., will be banked to an elevation of seven feet. Profile for the track will be the concave arc of a circle. The roadway will be 30 feet in width; the track, 1 9/10 miles in diameter and five miles in circumference. It will be made of compacted crushed rock aggregate, topped with macadam. Location will be northeast section of the proving ground.

The 20-mile turnpike road, designed to simulate sustained driving conditions, will meander over the proving ground in a wandering figure-eight pattern. Made of compacted crush rock topped with macadam, it will include six two-mile straightaways and banked curves ranging from 90 to 215 degrees. A two-lane road 24 feet wide, the turnpike's figure-eight layout will balance left- and right-hand turns. Two bridges will be built across Crownest Creek, which bisects the proving ground, and an underpass will be constructed to facilitate uninterrupted driving.

Sound Engineer Reports Nylon Tires Noisier Than Rayons

Louis S. Goodfriend, acoustical engineer, Scarsdale, N. Y., has concluded (based on the analysis of magnetic tape recordings) "that nylon cord tires create from 1.2 to 4.3 times the noise intensity of rayon cord tires when operated at the same speed for speeds ranging from 20 to 60 m.p.h."

The sound tests were made using a 1957 Oldsmobile equipped with first-line, four-ply 8.50 x 14 rayon cord and nylon cord tires at different times during the tests. The two sets of tires used had the same tread design and construction and differed only in regard to the type of tire cord used.

The research was conducted for American Viscose Corp.

The tests were conducted by placing the tape recorder and microphones in the rear seat of the car and recording the noise produced while the vehicle was driven over a predetermined test course. The test course included areas of macadam, concrete slabs, and standard concrete slab highway construction. Outside noises were minimized by closing car windows and air vents during the test runs.

In all experiments the car was left parked for a period of eight to 10 hours before beginning the test runs. This procedure was adopted in order that any characteristics of the tire developed by parking would become apparent.

At all speeds between 20 and 60 miles per hour the test equipment revealed that nylon cord tires are noisier than rayon cord tires. The differences in noise level were easier to observe at the beginning of the test runs. After 30 minutes of operation these differences were less apparent, but still significant.

While engineer Goodfriend made no attempt to explain the differences in noise level between the two types of tires, an American Viscose spokesman said it was partly due to the tendency of nylon cord tires to "set" and form flat spots when left parked.

In further discussing the question of "set," the Avisco spokesman related the result of a "pull test" conducted on the same test car used in the noise level study. After the car stood overnight on rayon cord tires, it required 95 pounds of tractive force to overcome rolling friction. Using the same car, parked for the same time at the same spot, but with nylon cord tires it required 125 pounds of force to start motion of the car.

New PGA Golf Ball

Hole-in-one trophies currently are being presented by Plymouth Golf Ball Co., Plymouth Meeting, Pa., to golf professionals and amateurs in conjunction with introduction of the official new PGA golf ball manufactured by the company.

Pliolite S-6B, a rubber reinforcing resin produced by the chemical division of The Goodyear Tire & Rubber Co., is utilized to reinforce the stock of the new ball and was chosen for this use because of the strength characteristics it imparts to the cover stock.

According to Plymouth, Pliolite S-6B acts as a plasticizer at elevated temperatures in that it flows into the winding, resulting in excellent adhesion. The company also reports lower costs and whiter stocks which can be painted brighter and which last longer. In addition, the rubber reinforcing resin imparts good scuff, cut, and abrasion resistance and improves flight of the ball.

Plymouth Golf Ball Co., second largest exclusive golf ball manufacturer in the United States, is sole producer of the official PGA ball.

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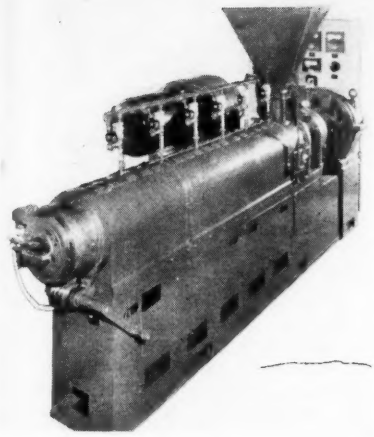
RSVP

To perforate, or not to perforate—that is the question. What is YOUR reaction?



4½- by 90-inch induction heated extruder

Extruder Heating Method

The use of induction heating of the extruder cylinder in combination with water cooling, a revolutionary temperature control system for extruders, has been announced by The Aetna-Standard Engineering Co., Akron, O.

Demonstrations on a 4½- by 90-inch plastics extruder show extremely fast response to heating or cooling. The machine can be brought to operating temperature from a cold start in 20 minutes, using less than one-fourth the energy required for conventional electrically heated machines. The energy requirements for operating are expected to be in the same proportion.

Designed and developed by Hale & Kullgren, Inc., associate company of Aetna-Standard, the induction heating system can be applied in a wide range of extruder sizes, both for rubber and for plastic. It can also be adapted to existing machines where fast temperature response is desirable.

Du Pont's New Nylon

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has announced it will discontinue production of Type 168 "Super Cordura" high-tenacity rayon at its Richmond, Va., plant on December 1, in preparation for starting up its new nylon plant scheduled to begin producing in January, 1958.

Employes producing Type 168 rayon, made only at the Richmond plant, will be trained for jobs in the new nylon operation or transferred to the manufacture of Type 272 "Super Cordura"—Du Pont's new high-strength rayon used for tire cord and other industrial products. Type 272 "Super Cordura" will continue to be made at capacity levels at the Richmond, Va., facility.

Du Pont announced its new nylon plant for Richmond in September, 1956, and construction started soon thereafter. The plant is designed to produce 40 million pounds annually of nylon fiber for tire cord and other industrial products.

Buys Curing Technique

Patent rights and trade marks covering manufacture and distribution of a new curing method for retreading tires have been purchased by The Goodyear Tire & Rubber Co., Akron, O., from Gibbs Research & Mfg. Corp., Janesville, Wis. The transaction also includes purchase of equipment for manufacture of the new curing method.

The Gibbs electronic speed cure is a method of applying heat to the inside of a tire casing while it is in the mold for retreading at the same time heat is being applied from the mold itself.

Principal items of equipment for the process consist of a rubber pad in which wires have been laid in serpentine fashion and an electronic control unit. In use, the pad is placed between the curing tube and the inside of the tire while the control unit maintains uniform temperature at the band surface throughout the curing period.

Use of the system is said to cut average curing time of retread tires about 50% while assuring more uniform cures which will result in longer tread wear.

Another FIRST for RUBBER WORLD

Certain pages of this issue of RUBBER WORLD are "scored" at the inside margin to make it easier for you to detach them for filing. We believe it is the first issue of any rubber-industry periodical to be so perforated for the greater convenience of readers.

This new service is just one of the many RUBBER WORLD readers have enjoyed in recent years. In January the table of contents was placed on page 3 for easier access.

Whether this page perforation becomes an every-issue feature depends on subscriber reaction.

Do you prefer perforated pages?

Borden's Plastic Products

A plastic garden hose with good flexibility and firmness characteristics in hot and cold weather has been developed by the Borden Co.'s chemical division. Known as the Resinite Gold Stripe, it will be introduced in 1958 as part of an expanded complete line of Resinite hose and sprinklers to be distributed by Borden's for the first time on a national basis.

The hose, featuring strong braided nylon cord embedded deeply in vinyl, is available in 25-, 50-, and 75-foot lengths, with ½-, ⅝- and ¾-inch inside diameters.

Borden's, which previously marketed a limited line of hose and sprinklers in 11 western states, decided on nationwide distribution following its recent acquisition of an eastern plastics plant, formerly Lawrence Process Co., North Andover, Mass. Its West Coast hose manufacturing plant is in Santa Barbara, Calif.

New Goodrich Acquisition

B. F. Goodrich Aviation Products, a division of The B. F. Goodrich Co., Akron, O., has purchased the land and buildings formerly owned by the West Coast Loading Co. at Rialto, Calif.

B. F. Goodrich, engaged in research in rocke. propellants since 1953, will continue research and development in this field in the Rialto location.

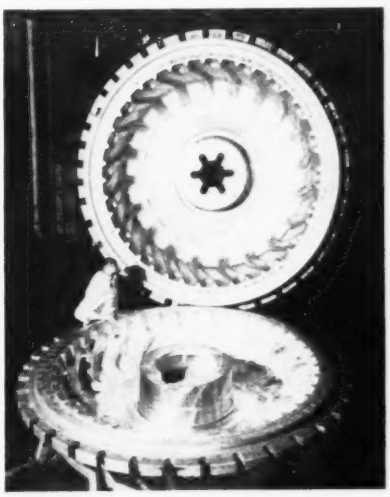
Harold W. Catt, formerly Goodrich general purchasing agent, will direct the Rocket activities, and A. B. Japs, formerly director of chemical engineering research in the company's research center, Brecksville, O., will be development manager.

Polymer Adds to Lab

Polymer Corp., Ltd., Sarnia, Ont., Canada, has announced that an addition to its research laboratory will be constructed for a completion date in 1957. These new facilities will be devoted to the maintenance of Polymer's position in the synthetic rubber field and are in keeping with the general growth of the corporation's activities. In particular, they will sustain an expanding research program in which increased attention is being directed to synthetic-natural rubber, a variety of latices, and other new polymers. It is estimated that the addition, together with equipment, furnishings, and other costs, will exceed an expenditure of $1 million.

Giant Tire Mold Sections

The Goodyear Tire & Rubber Co., Akron, O., recently installed in one of its plants twin aluminum tire mold sections for the production of mammoth tires for the construction industry. The molds, casted by the Aluminum Co. of America's Cleveland foundries, have a combined weight of almost eight tons and are 8 feet, 10 inches in outside diameter. Tires almost 7½ feet in diameter, and weighing 2,500 pounds, will be cured in the molds.



Alcoa aluminum mammoth tire mold back-up sections

News Briefs

The Timken Roller Bearing Co., Canton, O., owing to increased wages and cost of materials, has been forced to raise bearing prices an average of 6%.

The Goodyear Chemical Division's New York address is 400 Park Ave., New York 22, N. Y. Donald E. Neese is the division's district manager.

Rubber Dynamics, Inc., has announced the opening of its new plant and executive offices for the manufacture of molded rubber and synthetic products at 120 W. 154th St., Gardena, Calif. Donald B. MacAfee was elected president and general manager of the firm.

The National Cash Register Co., Dayton, O., uses some 70 B. F. Goodrich Chemical Co. Hycar nitrile rubber parts for reducing maintenance and aiding performance of the business machines it manufactures. The parts perform such important jobs as absorbing shock, supporting weight, deadening sound, supplying driving power, and dampening vibration.

The Pittsburgh Coke & Chemical Co., Pittsburgh, Pa., has issued a new sales data sheet featuring industry-wide economic information. Designed for its coal-derived industrial chemicals, the latest specification sheets give not only specifications, properties, and commercial information on any Pittsburgh Industrial Chemicals Division product, but also pertinent economic information on the reverse side. Form is a logarithmic-style graph which charts production and sales of maleic anhydride, the product described.

Bjorksten Research Laboratories Industry, Inc., Madison, Wis., has opened its new laboratory at Houston, Tex., which will conduct sponsored industrial research for the many companies located in the rapidly expanding chemical and industrial area of the Southwest. The building contains about 6,500 square feet of floor space and the laboratory is equipped with modern facilities for carrying on research in a wide variety of fields.

The J. H. Day Co., division of The Cleveland Automatic Machine Co., Cincinnati, O., has opened a larger, more complete customer lab service. The new laboratory has the most modern facilities for running product test simulating actual full-scale production. The company's products include mixers, blenders, sifters, tanks, mechanical and Airmatic conveying units, and all types of baking machinery.

C. K. Williams & Co., Inc., has moved its New York metropolitan area sales office from Brooklyn to 655 Clinton Ave., Newark, N. J. Manager of the new office is George A. Wells, and sales representatives are J. M. Heim, P. P. Juley, Jr., and R. J. Stuebing.

Diamond Black Leaf Co.'s operations have been integrated with the business interests of Diamond Alkali Co., Cleveland, O. Diamond Black Leaf, producer of agricultural chemicals for farm use and lawn and garden products for home use, now becomes Diamond Black Leaf Products, a unit of Diamond Alkali Co.

The Firestone Tire & Rubber Co.'s Memphis, Tenn., plant has begun operation of a battery of new Bag-O-Matic tire presses. The most modern automatic presses available, the new machines were installed as part of the company's current expansion and modernization program, which includes construction of four new plants at a cost of more than $30,000,000.

Furane Plastics, Inc., Los Angeles, Calif., has formed a new division devoted to the selling of its many adhesives and sealants. The adhesive division will be backed up by an aggressive production research and development group and staffed with technically qualified adhesives application engineers, to provide field service on the wide range of adhesives.

The B. F. Goodrich Chemical Co., Cleveland, O., has announced a new name designation along with a price reduction for a high-styrene rubber processing material. Price of the rubber reinforcing and stiffening material formerly known as Good-rite Resin 50 has been reduced 3¢ a pound. Henceforth, the resin will be known as Good-rite 2007, so designated that it will bring the material into proper sequence with the nomenclature for other rubbers and chemicals offered by the company.

The Rubatex Division, Great American Industries, Inc., Bedford, Va., is supplying extruded closed cellular rubber products tailored to virtually any shape required by industry. A wide variety of cord, tubing, and other extruded shapes is already being produced to the specifications of manufacturers in the automotive, refrigeration, and electrical fields, with applications foreseen for all types of linear shapes. Through the new extrusion process it is possible to produce materials of virtually any desired length as well as a variety of shapes of neoprene and nitrile rubbers.

George Woloch Co., Inc., carrying an inventory of all types of rubber and plastic materials for the industry, has announced purchase of a building at 514 W. 24th St., New York, N. Y., where the main office of the company is now located.

Du Pont of Canada, Ltd., plans a plant to make linear polyethylenes in Moore Township, south of Sarnia, Ont. The proposed plant is said to include facilities for the polymerization of ethylene, and compounding of the finished product.

Canadian Titanium Pigments, Ltd., subsidiary of National Lead Co., has built a titanium pigment plant, Canada's first, at Varennes, P.Q. The new plant is said to make Canada virtually self-sufficient in titanium pigments. It was designed to keep pace with the rapidly expanding Canadian economy, particularly those industries which titanium pigments serve—paint, paper, rubber, and plastics.

Becco Chemical Division, Food Machinery & Chemical Corp., Buffalo, N. Y., has broken ground for a new distributing center in Framingham, Mass., to serve the New England area. The new center will replace the company's former distribution center in downtown Boston. Philip D. Caine, New England manager for Becco, will be in charge.

The Military Clothing & Textile Supply Agency plans to procure in the near future approximately 9,912 each of mattress, bed, crew's, synthetic sponge rubber with smooth skin finish, cored bottom removable, preshrunk, fire resistant striped cover, 72½ inches long, three inches thick, 20 pounds maximum weight. Deliveries will be scheduled from February, 1958—September, 1958. Invitations for bid will be mailed to those firms currently on the bidder's list. Other interested suppliers should contact the Military Clothing & Textile Supply Agency-Philadelphia Quartermaster Depot, U. S. Army, 2800 S. 20th St., Philadelphia, Pa., Attention: Purchasing Division, Textile Branch.

Diamond Alkali Co., Cleveland, O., has launched a voluntary personal thrift program for some 6,200 employes of the firm. The plan provides Diamond employes with a convenient means of systematically saving, through regular payroll deductions over a three-year period, a portion of their current income and earning 5% interest annually on such savings. Also, it gives employes an opportunity to invest their savings accumulated in this manner in Diamond common stock.

The Timken Roller Bearing Co., Canton, O., has appropriated $500,000 for the purpose of installing a consumable electrode vacuum electric furnace. Capacity of the furnace will be five million pounds of cleaner steel of high fatigue strength and ductility per year or approximately 200 tons per month. Twenty-four-inch ingots can be produced by the new furnace, which is expected to be completed by June 1, 1958.

News About People

Firestone Steel Products Co., Akron, O., has begun operation of a giant, heavy-duty machine which can permanently dye aluminum any color. The new anodizing section, which has begun production on 1958 automobile grills and body trim, occupies 10,000 square feet of floor space and can treat 5,000 square feet of aluminum an hour. Anodized aluminum can be etched, brushed, buffed, or treated in a variety of ways to create an almost unlimited number of colors and textures. It can be dulled to a matte finish or chemically brightened to resemble chrome.

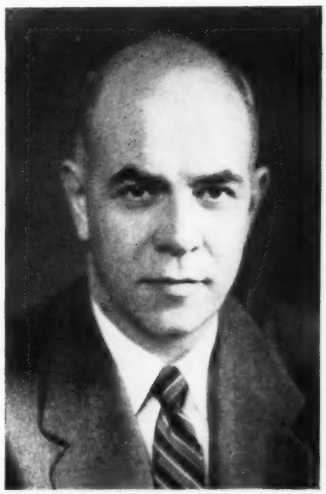
The Consolidated Edison Co., New York, N. Y., to accommodate the expansion and contraction of the huge boilers in its Astoria plant, utilizes a total of 234 flexible couplings made from Dow Corning's Silastic rubber in the coal-handling lines running from ball mills to boiler fireboxes. Fabricated by Niagara Rubber, Plainfield, N. J., for Victaulic Co., manufacturer of the couplings, the test seals have already paid for themselves several times over by entirely eliminating replacement costs.

The B. F. Goodrich Industrial Products Co. has opened a warehouse in Hanover, Pa., from where it will distribute its complete line of shoe products to insure prompt service in the Pennsylvania-Maryland areas. At the same time, Bristol Rubber Co., which has warehoused Goodrich shoe products for a number of years, has opened a warehouse in Reading, Pa., and will stock shoe soling slab material. William E. Gill, Goodrich shoe products sales representative in the Pennsylvania area, has been appointed manager of the Hanover operation.

Goodyear Tire & Rubber Co.'s president, E. J. Thomas, has been awarded a Department of Defense citation by Maj. Gen. James R. Pierce, deputy commanding general, Second United States Army, Fort Meade, Md., for the firm's outstanding cooperation with the reserve program of the Armed Forces.

Diamond Alkali Co., Cleveland, O., a leading producer of basic industrial and agricultural chemicals, is now producing U. S. P. Grade calcium carbonate on a commercial scale at the firm's Painesville, O., plant. Diamond has been producing calcium carbonates since 1925 for paint, plastics, rubber, printing ink, and other industries, but this new production will mark the company's entry into the making of a premium-grade calcium carbonate.

Lord Mfg. Co., special products division, Erie, Pa., is currently expanding its services to provide direct-to-customer assistance in the problems of bonding. The company, pioneering in the research, development, and manufacture of adhesives, under the trade name Chemlok, has announced the appointment of technical sales representatives in eastern and midwestern areas. Paul E. Dochety will serve the central and midwestern states, with headquarters at Akron, O. James Brennan will serve the eastern states, with headquarters in Jersey City, N. J.



Fabian Bachrach

Neil B. Conley

William H. Bowman

William H. Bowman has been appointed general manager, and **Neil B. Conley** assistant general manager of the organic chemicals division, American Cyanamid Co., New York, N. Y. The division's seven commercial departments market petrochemicals, dyes, intermediates, explosives, rubber chemicals, textile resins, and specialty products.

James Boyd, in charge of factory technical service departments, has been named technical manager-tires by the Dunlop Tire & Rubber Corp., Buffalo, N. Y.

H. E. Morse, formerly manager of industrial and shoe products development, has been appointed director of industrial products development, Goodyear Tire & Rubber Co., industrial products division, Akron, O. **D. E. Harpfer** has been promoted from assistant manager of industrial products development to manager of industrial products technical liaison. **John H. Gerstenmaier,** manager of development for the company's St. Marys, O., plant, has been advanced to manager of industrial products development. **J. J. Hickey,** formerly head of development at Wolverhampton, England, has been named manager of industrial products development for international plants. These changes were being made to improve liaison between Akron operations and outside industrial products plants in the research and development activities of the company.

Bertrand A. Landry and **Richard J. Lund** have been named assistant technical directors of Battelle Memorial Institute, Columbus, O. **David D. Moore** was named manager of the Institute's Department of Economics. Landry, just returned from Paris, France, is one of the country's leading technologists in the field of combustion and energy. Lund, a geologist and mineral economist, has directed Battelle's technical-economic studies since the department was first organized. Moore has guided numerous technical economic studies since becoming associated with the Institute in 1948.

Francis J. Sergeys has been appointed vice president in charge of development of W. R. Grace & Co.'s research and development division, New York, N. Y. In his new post he will be responsible for the engineering and commercial research activities of the division.

Thomas J. Gorman has been appointed director of purchases, Quaker Rubber Division, H. K. Porter Co., Philadelphia, Pa. Gorman, associated with Quaker since 1939, has been chief chemist for the past ten years. His new duties will include supervision of all purchases for Quaker Rubber Division.

Ralph D. Webb, head of the instrument department of Union Carbide Chemicals Co.'s South Charleston plant and veteran of 33 years in the instrument field, has been elected to honorary membership in the Instrument Society of America. He supervises all aspects of instrument engineering operations in the South Charleston plant. During World War II he personally designed the instrument engineering for Carbide's butadiene-from-alcohol process.

Melvin A. Wilson has been appointed manager-engineering, truck tire development; **Philip W. Drew** succeeds him as manager-engineering, automobile tires. The Goodyear Tire & Rubber Co., Akron, O. **C. Robert Case** was appointed to the newly created position of development manager-tires, Goodyear International plants. In filling the vacancy created by Case's new assignment, Wilson is responsible for all development activities covering the company's full line of truck and tractor tires. Drew, manager of Captive-Air Safety tire development prior to his new appointment, continues to be responsible for this activity, as well as other types of passenger tire design. Case is responsible for all tire development activities being conducted for the International company's world-wide network of plants. He is assisted by **L. R. Kilpatrick,** assistant development manager-tires, and by **C. W. Sanderson,** manager-field surveys. **C. W. Moss,** manager of large off-the-road tire development, also has been placed in charge of tubes and accessories development.

Robert Rutan

Robert Rutan, formerly superintendent of the synthetic rubber division, International Packing Corp., has joined the sales staff of Thiokol Chemical Corp., Trenton, N. J., as technical representative in the butyl sales department, which is under the direction of John T. Dunn. Thiokol produces special synthetic rubbers, plasticizers, and chemicals.

Roger W. Strassburg has been appointed manager of the general chemical laboratories for The B. F. Goodrich Co., Akron, O. He succeeds **Roger Bossen,** transferred to B. F. Goodrich Tire Co. on special assignment.

James N. Cossitt has been named assistant to the sales manager of the automotive division of The Wooster Rubber Co., Wooster, O. He takes the place of **Edward J. Fredericks,** who has been promoted to assistant sales manager of the houseware division of the company.

G. Warren Crockwell

G. Warren Crockwell has been appointed technical service supervisor of silicone rubber for Silicones Division, Union Carbide Corp., New York, N. Y. He is stationed at the Tonawanda, N. Y., laboratories.

Ted E. Lannefeld and **John B. Baker** have been appointed sales representatives in the New England territory for the General Latex & Chemical Corp., Cambridge, Mass.

Winthrop Brown, Jr., has retired after 46 years of an active and competitive business life. His main interest for the past ten years has been the B. F. Goodrich Flooring Co., Watertown, Mass.

Warren B. Freedlund has been appointed northeastern sales representative, headquartered in New York, N. Y., for the Polychemicals Division of West Virginia Pulp & Paper Co., Charleston, S. C. The division produces Indulin and Polyfon, products which have broad applications in such diverse fields as asphalt emulsions, protein removal and recovery, resin extension, rubber reinforcing, insecticide dispersants, and ceramics.

Curtis W. Noyes has been promoted to Mid-Atlantic district sales manager for the B. F. Goodrich Flooring Co., Watertown, Mass. Noyes succeeds **Paul Coste,** who will be in charge of special sales assignments until his retirement on February 28, 1958. **Thomas R. Stenson** has been appointed sales representative for western Pennsylvania and West Virginia, formerly covered by Noyes.

Paul M. LaFlamme, upon completing his Ph.D. requirements in chemistry at Yale, has joined the research department at The Carwin Co., North Haven, Conn. **Edward D. Walen,** formerly plant manager of Pacific Mills' Brookneal Mills and previously assistant director of research of Pacific Mills' worsted division, has been appointed assistant to the president of the Carwin company.

Whitney R. Kerchner has been appointed advertising and sales promotion manager for Firestone Plastics Co., Pottstown, Pa. He will be responsible for advertising and sales promotion for the company's Exon resins and Velon film, sheeting, and monofilament.

William O. Green has been made director of oil marketer sales, tire division, United States Rubber Co., New York, N. Y. He will have charge of the expansion and coordination of the tire division's marketing program to the oil industry.

Ernest E. Holdman has been named vice president and general manager of Heyden Newport International, a newly formed division of Heyden Newport Chemical Corp., New York, N. Y., which will be responsible for handling export sales of both naval stores and chemicals and will have sales offices in principal cities throughout the free world. **Clement H. Horst** has been made assistant vice president in charge of naval stores products for export, while **Richard H. Boggs** has been appointed sales manager, chemicals for export.

R. S. Wilson, executive vice president in charge of sales, has been awarded a service emblem commemorating 45 years of continuous association with Goodyear Tire & Rubber Co., Akron, O. Presentation of the award was made by P. W. Litchfield, Goodyear chairman of the board.

D. S. Black, former senior sales service staffman, has been named sales development manager of the Goodyear Tire & Rubber Co.'s chemical division, Akron, O. **P. A. Koons,** former special representative in the division's Cleveland office, has been appointed senior sales engineer. **W. F. Overberger** and **R. E. Draman** have been assigned as sales engineers for rubber chemicals and Rubarite products, respectively. **R. E. Dyer,** who returned recently to Goodyear after two years of military service, has been appointed sales trainee.

D. S. Black

William T. Cloake, technical representative of the Neville Chemical Co., has been relocated from Pittsburgh to Dallas, Tex., where he will cover eleven southern and southwestern states. Also relocated from Pittsburgh were **William Craig,** whose territory now includes five midwestern states, and **Donald L. Marsh,** who will cover New England, New York, New Jersey, Philadelphia, and Wilmington, Del.

A. F. Thomas, former division eastern regional manager, has been appointed to the newly created post of division field sales manager of The Goodyear Tire & Rubber Co.'s films and flooring division, Akron, O. **J. D. Long,** formerly western regional manager, has been named manager of flooring sales. Long succeeds **H. M. Evans,** now assigned to special projects in conjunction with the flooring department.

Joseph H. Ehrhardt

Joseph H. Ehrhardt has been appointed technical product development engineer at Marbon Chemical, Division of Borg-Warner Corp., Gary, Ind. He will be responsible for promoting new usages, markets, and increased acceptance of Cycolac plastic compounds in various industries, consistent with the expanding production available from Marbon's new Woodmar plant facilities at Parkersburg, W. Va.

Robert Kirk has joined Amoco Chemicals Corp., Chicago, Ill., recently organized subsidiary of the Standard Oil Co. of Indiana, as manager for the international sales of the company's products including petroleum additives, solvents, hydrocarbon resins, plasticizers and chemical intermediates.

Edwin P. Schrank has been appointed manager of production and engineering at Seiberling Rubber Co., Akron, O. He will fill a position created following election of **A. L. McMullen** as vice president in charge of production at Seiberling Rubber Co. of Canada, Ltd.

Cameron J. Duff will cover a new sales territory comprising the entire state of Michigan for the organic chemical division of Witco Chemical Co., New York, N. Y.

Samuel C. Colbeck has been appointed a buyer in the chemical procurement department of Pittsburgh Coke & Chemical Co., Pittsburgh, Pa. Prior to assuming the new position, he was a technical sales representative of the company's activated carbon division.

Robert L. Nowicki, Richard A. Potter, and **Julian H. Stevens** have been appointed territory sales managers for Landers Corp., Toledo, O. The new appointments represent a new marketing strategy for Landers in that all field sales people previously had been based at the home office. Mr. Nowicki, located in Chicago, will be in charge of sales for the Chicago marketing area. Mr. Potter will headquarter in Toledo and cover a central territory; while Mr. Stevens, at Cleveland, will manage that district.

Charles B. Cooper, plant manager of the Akron, O., chemical plant of B. F. Goodrich Chemical Co., Cleveland, O., has been named plant manager of the company's new Henry, Ill., general chemicals plant. **Edwin W. Harrington,** director of rubber and rubber chemicals development at the company's development center, Avon Lake, O., succeeds Cooper at the Akron plant.

Donald A. Levine has been elected a vice president of Great American Industries, Inc., Elyria, O. He will continue his present duties as general manager of the Rubatex Division, Bedford, Va., producer of closed and open cellular rubber products for industry.

H. William Peterson, district supervisor in the Middle Atlantic States area for Enjay Co., Inc., has been named assistant manager of the company's alcohols and chemicals division, New York, N. Y.

H. William Peterson

John W. Berg

John W. Berg has been named Pittsburgh district sales manager for Pennsylvania Industrial Chemical Corp., Clairton, Pa. Prior to joining PICCO's staff, he was the Mid-Atlantic sales representative for Alco Oil & Chemical Corp.

William C. Bedoit, Jr., senior research chemist at the research laboratories, Jefferson Chemical Co., Inc., Austin, Tex., has been appointed manager, market development, of the company's commercial development division in Houston. He will be responsible for all phases of market development.

Walter F. Brown, manager of marketing research and planning, U. S. Tires division, United States Rubber Co., New York, N. Y., has been advanced to general sales manager. He will be responsible for all replacement sales of passenger, truck, farm, off-the-road, and industrial tires sold under the U. S. Royal brand name. Also were appointed **James A. Napier** and **James R. Tully** as assistant sales managers, U. S. Tires division. Napier will have charge of operations, and Tully, of products and merchandising.

John Sutton has been named manager of engineering for the adhesives division of the B. F. Goodrich Industrial Products Co., Akron, O.

James Dunne has been appointed Midwest sales representative, under the direction of **C. M. Baldwin,** Midwest sales manager, for United Carbon Co., at Chicago, Ill.

H. Stanley Johnson has been named sales manager, national accounts, of the Boston Woven Hose & Rubber Co., Division of American Biltrite Rubber Co., Inc., Cambridge, Mass. Formerly consumer products sales manager, Johnson will now coordinate and direct the company's sales operations to original equipment manufacturers, and large industrial consumers.

Alfred P. Marone

Alfred P. Marone, a Witco sales representative in Los Angeles, Calif., has been appointed Los Angeles district manager of Witco Chemical Co., New York, N. Y. With the company since 1954, Mr. Marone now will serve as sales manager for the Los Angeles area and also be responsible for the operation of the firm's plant there.

E. J. Thomas, president of the Goodyear Tire & Rubber Co., Akron, O., **P. E. H. Leroy,** executive vice president, and **F. T. Magennis,** president of Goodyear International Corp., took part in dedication of the company's newest foreign plant in Glasgow, Scotland, September 26. The plant is of modern straight-line tire production design, producing 1,200 tires a day, divided about equally between passenger and truck tires.

D. Coleman has been appointed section head in charge of polymer research, Monsanto Canada, Ltd., Montreal, P.Q., Canada. For the past ten years he has been engaged in high polymer research involving synthetic fibers, with a major British chemical company. Also announced were the appointments as research chemists of **T. H. Waid** and **F. M. Karpfen.**

L. George Hoth has been promoted to manager of a newly created merchandising section of the consumer products department, Chemical Division, Borden Co., New York, N. Y. Hoth, formerly assistant sales manager for adhesives, will be aided by **Martin F. Cody,** who has joined the department as assistant merchandising manager.

Claude R. Mason celebrated his fiftieth year with The B. F. Goodrich Co., Akron, O., August 15. Mason, service manager of B. F. Goodrich Tire Co., is rated one of the top servicemen in the industry. He will retire in May, 1958.

Harrison T. Doyle, for the last 16 years with Bridgeport Brass has been designated New England representative of the Summit Chemical Co., Akron, O.

Edwin T. Asplundh has been elected board chairman of the Pittsburgh Plate Glass Co., Pittsburgh, Pa. He succeeds **Harry B. Higgins,** who is retiring as board chairman and chief executive officer. **David G. Hill,** president of the corporation since 1955, will continue in that capacity and assume the additional duties of chief executive officer. **Felix T. Hughes** was elected vice president of the merchandising division, succeeding **Donald C. Burnham,** who also retires.

David G. Hill

R. Bruce Baptie has been promoted to the sales organization, The Carwin Co., North Haven, Conn. Succeeding Baptie as development superintendent is **Harry E. Smeal.**

Charles L. Woods, Jr., supervising engineer, has been appointed plant engineer for the Louisville, Ky., plant of B. F. Goodrich Chemical Co. He succeeds **Russell C. Grover,** recently named plant engineer at the chemical firm's new Henry, Ill., plant now under construction.

Robert Van Patten-Steiger has joined New Jersey Rubber Co., Taunton, Mass., as assistant to the president. Prior to joining New Jersey Rubber, he served as a sales representative for Harwick Standard Chemical Co.

Raymond F. Hart, treasurer, American Synthetic Rubber Corp., Louisville, Ky., has been elected to membership in the Controllers Institute of America, New York, N. Y.

Edward M. Roth, Jr., has been transferred to the western New York territory as a sales representative for Becco Chemical Division, Food Machinery & Chemical Corp., Buffalo, N. Y.

Ray V. Lambert, foreign auditing, has been appointed comptroller of The Firestone Tire & Rubber Co. of the Philippines. The new Philippine plant, now under construction, is scheduled to begin production in October, 1957.

Edwin T. Asplundh

A. V. Redfern has been named director of purchasing of Dunlop of Canada, Ltd., Toronto, Ont.

Galo W. Blanco has retired as plant manager of the Cleveland plant of Industrial Rayon Corp., Cleveland, O., and has been succeeded by **F. Russell Cashner,** industrial engineering manager for the company since 1946. During the 29 years Dr. Blanco was with Industrial Rayon, he had an important part in its growth into a major producer of fibers.

Kimon T. Karabatos has been appointed director of government relations, Velsicol Chemical Corp., Chicago, Ill. Formerly director of legislative and special services for the National Agricultural Chemicals Association, Karabatos in his new capacity will have his headquarters in Washington, D. C.

H. D. Tompkins, vice president, The Firestone Tire & Rubber Co., was re-elected chairman of the Inter-Industry Highway Safety Committee. Elected to board membership was **G. R. Cuthbertson,** vice president, United States Rubber Co., and general manager of its tire division. **J. A. Hoban,** vice president, marketing, The B. F. Goodrich Co., was elected to the executive committee of the board of directors. Other members of the Inter-Industry Committee include. **L. A. McQueen,** vice president, The General Tire & Rubber Co., and **Victor Holt, Jr.,** vice president, The Goodyear Tire & Rubber Co.

Albert H. Cooper has been named general manager of American Industrial Chemical Co., Division of Amerace Corp., Butler, N. J. One of the country's acknowledged top authorities in the field of silica gels and silicates, Dr. Cooper directed the development of the unique new continuous process now producing silica gel and other silicas at the company's new Butler plant.

[1] RUBBER WORLD, Sept., 1957, p. 865.

Obituaries

Franklin R. Hoadley, Sr.

Franklin R. Hoadley, Sr., a retired president of Farrel-Birmingham Co., Inc., Ansonia, Conn., and a former president and treasurer of Atwood Machine Co., Stonington, Conn., died of a heart attack, September 12, at his home in Stonington.

Mr. Hoadley joined Farrel-Birmingham in 1914, the same year he was graduated from Yale University. Employed first as a core-maker apprentice, he progressed steadily to become assistant foundry manager in 1919, manager of foundries in 1927, a director of the company in 1923, and vice president in 1930. He resigned as vice president of Farrel-Birmingham in 1937, to become president and treasurer of Atwood Machine Co., remaining a director of Farrel-Birmingham.

He retained these positions until 1945, when he returned to Farrel-Birmingham as president, holding this position until retirement in 1955.

A leading figure in the nation's industrial life for many years, Mr. Hoadley was a past president of the Gray Iron Founders Society and of the National Founders Association and during NRA was chairman of the Gray Iron Foundry Industry's Code Authority.

He was born in Ansonia, April 1, 1890. Mr. Hoadley was also a man of wide civic interests. In addition to holding numerous posts in civic and social organizations, he was a vestryman of the Calvary Episcopal Church in Stonington, where his funeral services were held.

Mr. Hoadley is survived by his wife, two daughters, a son, and nine grandchildren.

Harold L. Pettingell

Harold Lawton Pettingell, 69, a retired vice president of the Lee Rubber & Tire Corp., Conshohocken, Pa., died September 2 in a Brooklyn, N. Y., hospital, following a brief illness.

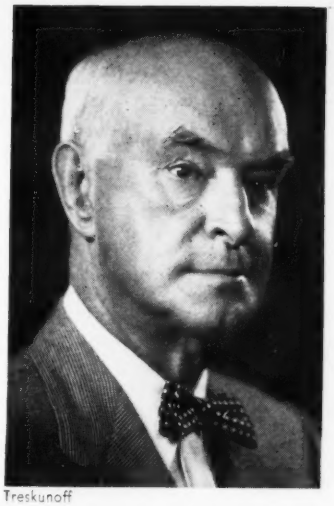
He was formerly manager of the New York, N. Y., branch of the Lee Tire & Rubber Co. of New York, Inc. In 1937 he was elected vice president in charge of sales and was assigned to the Conshohocken offices. In 1945 he became general sales manager and in 1948 was elected senior vice president and named regional manager. At the time of his retirement last year, after more than 45 years with Lee, he was senior vice president of the Lee sales subsidiary.

Mr. Pettingell was the past president of the Monmouth Beach Club and was also a Mason and a Knights Templar.

During World War I he served as an officer with the AEF and was awarded the French Croix de Guerre with palm for gallantry in action.

Funeral services were conducted from the F. E. Campbell Funeral Church, New York, on September 6.

He is survived by his wife and a son.



Treskunoff

Franklin R. Hoadley, Sr.

Zina A. Wise, Sr.

Zina A. Wise, Sr., 57, president of Griffith Rubber Mills, Portland, Oreg., died September 19, during a business trip to San Francisco.

In 1933 he became manager of Griffith Rubber Mills and in 1951, president. Under his leadership the company acquired a wholly owned subsidiary in Seattle, Wash., and an affiliation with a Vancouver, B.C. plant. The deceased was also associated with Oregon Insurance Finance Co., Warren Construction Co., States Steamship Co., Crown Williamette Paper Co., Investors Co. of Oregon, and Wise Products, Inc.

He served as Oregon co-chairman of the National Conference of Christians and Jews, was a member of a local draft board during World War II, was past chairman of the Multnomah County March of Dimes, and was active in the Red Cross and Community Chest drives.

Wise leaves a wife and two sons.

Edgar L. Longaker

Edgar L. Longaker, 75, a pioneer in the development of storage batteries for submarines and automobiles, died August 29 after undergoing surgery in a Norristown, Pa., hospital.

For many years manager of design engineering for Exide Industrial Division of The Electric Storage Battery Co., Mr. Longaker helped before World War 1 in the designing of the first modern-type-battery—an Exide—used to propel submarines while under water. He also helped design the first battery which powered the first automotive self-starter. The battery was used in the 1912 Cadillac.

Holder of several patents in the storage battery field, Mr. Longaker retired from Exide in 1951 after 50 years' service with the company. He was a member of the Exide Quarter-Century Club.

Mr. Longaker is survived by his wife, a daughter, and a son.

Financial

Baldwin Rubber Co., Pontiac, Mich. Year ended June 30, 1957: net profit, $664,747, equal to $1.55 a share, compared with $983,265, or $2.28 a share, in the preceding fiscal year.

Canada Wire & Cable Co., Ltd., Leaside, Toronto, Ont. First half, 1957: net income, $711,000, contrasted with $1,245,000 in the 1956 half.

Firestone Tire & Rubber Co., Akron, O., and subsidiaries. Nine months ended July 31, 1957: net income, $44,583,808, equal to $5.40 a common share, compared with $42,904,733, or $5.27 a share, a year earlier; net sales, $844,603,697, against $813,750,210.

W. R. Grace & Co., New York, N. Y., and subsidiaries. First half, 1957: net profit, $8,790,649, equal to $1.90 a share, compared with $10,547,544, or $2.37 a share, in last year's half; net sales, $173,690,517, against $170,505,395.

Great American Industries, Inc., Elyria, O. First six months, 1957: profits, $389,258, against $358,000 in the same period last year; sales, $8,957,845, against $7,636,396.

Lee Rubber & Tire Corp., Conshohocken, Pa. Nine months ended July 31, 1957: consolidated net earnings, $1,203,350, equal to $1.42 a capital share, against $1,162,375, or $1.37 a share, in the like period last year; net sales, $34,119,316, against $33,726,284.

McNeil Machine & Engineering Co., Akron, O. Seven months ended July 31, 1957: net profit, $1,963,400, equal to $3.25 a share, compared with $1,400,000, or $2.50 a share, in the 1956 months, sales, $25,786,362, against $19,982,125.

Raybestos-Manhattan, Inc., Passaic, N. J. June half, 1957: net profit, $1,843,054, equal to $2.93 a share, compared with $1,983,449, or $3.16 a share, a year earlier.

A. G. Spalding & Bros., Inc., Chicopee Mass. Nine months to July 31, 1957: net profit, $735,000, equal to $1.21 a share, against $545,000, or 95¢ a share, in the '56 period.

News from Abroad

Great Britain

Monsanto Chemical Changes

To meet the requirements of the continued growth of its business and its current program of expansion, Monsanto Chemicals, Ltd., London, has decided to divide operations between two new divisions—the chemicals division, which will handle heavy and fine chemicals, and the plastics division, which will handle plastics, rubber chemicals, oil additives, and other technical chemicals. The managing director, D. R. Mackie, will be director of the chemicals division; while the technical director will also be director of the plastics division.

The wholly-owned subsidiary, Monsanto Plastics, Ltd., will cease to function in view of the change to divisional organization. Sales of styrene plastics are now the responsibility of the plastics division.

New Latex Gelling Agent

A new heat-sensitive gelling agent for latex has been announced that minimizes the rigid production controls generally required.[1] Called Polyglycol HS. 35/40,[2] the material is effective only at elevated temperatures and has the following advantages over the more common gelling agent sodium silicofluoride: (1) Deammoniation and maturation of the latex compound is not essential. (2) The proportion of Polyglycol HS. 35/40 in the compound is not critical, and no allowance has to be made for variations in room temperatures. (3) Foams containing Polyglycol HS. 35/40 have stability at room temperature. (4) Low-viscosity solutions of this gelling agent are easily prepared and can be added to latices without difficulty. (5) Loaded compounds are processed without difficulty.

Lightly loaded and highly loaded foam compounds may be made. Gelation at 55-65° C. is achieved in a mold, and vulcanization at 100° C in steam or hot water follows. Highly loaded foam compounds for spreading may be gelled in hot air at 90° C., and drying and vulcanization effected at a convenient temperature.

It is suggested that the use of Polyglycol HS. 35/40 should appeal particularly to small firms entering this field because of the minimum of supervisory control required when this material is being used in latex foam product manufacture.

[1] *Rubber Developments*, 10, 48 (1957).

[2] The use of Polyglycol HS. 35/40 as a gelling agent for latex compounds requires permission from the patent owners, Oxirane, Ltd., Shell Chemical Co., London, England.

Medal Awards, 1957

The Institution of the Rubber Industry has announced that its Council has made the following awards: the Colwyn Medal, to H. W. Melville, for conspicuous services in the field of polymer science; the Hancock Medal, to F. M. Panzetta, for outstanding services to the industry and the Institution.

The medals will be presented by IRI President A. S. Bishop at the annual dinner to be held in London, December 11.

France

1956 Rubber Use Up 12%

The French rubber industry continued its progress during 1956, official figures of the consumption of rubber by the different branches of the industry last year reveal. The total amount came to 193,240 metric tons, against 172,744 tons in 1955, an increase of almost 12%. The tire industry was responsible for 106,593 tons, against the 93,798 tons in 1955, a rise of 13.6%. General rubber goods accounted for the remaining 86,647 tons in 1956, which compares with 78,946 tons in 1955, and shows an increase of almost 10%. While the amounts for inner tubes decreased slightly, those for practically all types of tires advanced, especially for automobile tires, where the increase came to 16.5%.

The upward trend in general rubber goods was noted in almost all lines except foot-wear, crepe soles, other soles and heels; it was especially marked in the case of carpet (almost 50%) and sponge and cellular rubber (30%).

The following table shows the amounts (in metric tons) of rubber used for the main products in 1955 and 1956:

	1956	1955
Automobile tires	85,640	73,493
Tubes	7,196	7,216
Cycle tires	6,278	5,923
Tubes	1,332	1,383
Retread compounds	5,161	4,885
Rubberized fabric	2,788	2,610
Tubes and hose	4,852	4,449
Belting	4,733	4,326
Mats and carpeting	5,161	3,460
Sponge and cellular rubber	9,924	7,636
Footwear	10,739	11,042
Crepe soles	4,487	4,937
Other heels and soles	7,554	7,602
Mechanical goods	16,559	15,057

Filler for Butyl Rubber

Under the name of Tuboryl a French firm has put on the market a locally produced light-colored filler, especially developed for butyl rubber. This is an anhydrous aluminum silicate, of a salmon pink color, in the form of a fine powder with average particle size of two microns. It is easily incorporated in butyl compounds, the extrusion qualities of which it is said to improve. Among the outstanding properties of Tuboryl are non-hygroscopicity and its color, which latter permits a wide variety of shades to be easily obtained, including yellow, green, and even blue.

Its reinforcing effect approaches that of SRF carbon black. Mechanical properties are not so good as with ultra-fine silicas, but to offset this drawback, Tuboryl makes for easier extruding, and in addition it can be incorporated in far larger proportions without impairing processibility. Very good compounds are obtainable by using it alone or in combination with other high-grade fillers, silicas, or blacks. Finally, it gives products which are claimed to have low permeability to gas and excellent resistance to insulation.

Japan

Special Synthetics, SBR, And Fibers To Be Made

The plan of the Japanese Geon Company, a chemical firm, for a technical tie-up with The B. F. Goodrich Co., Akron, O., U.S.A., for synthetic rubber production, has been approved by the Foreign Investment Council of the Finance Ministry. The Geon company, affiliated with the Furukawa interests, including the Yokohama Rubber Co., will build a new plant near Tokyo, which is expected to begin operating in 1959. Initial output will be 8,500 tons annually and will include acrylonitrile fiber, high-styrene rubber and latex, and some special types of SBR. Butadiene will be supplied by Japan Petrochemical Co. In the second stage of its program, Japanese Geon hopes to increase synthetic rubber production to 15,000 tons a year.

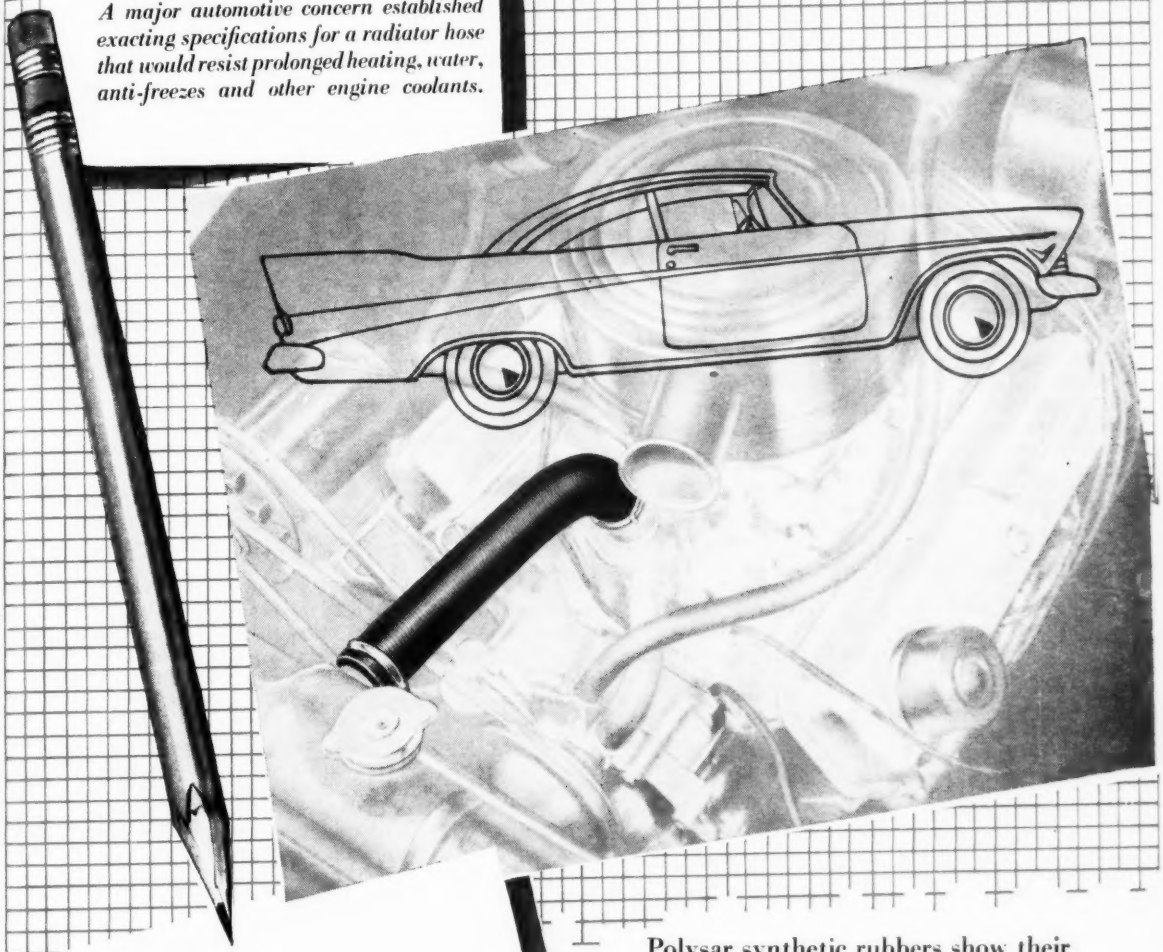
The Geon undertaking is not considered likely to compete with the semi-official synthetic rubber company scheduled to be established the past August—at least not so far as the majority of the products are concerned. The Japan Synthetic Rubber Industry Co., as the latter reportedly will be called, is to have a capital of $6,500,000, of which the government and rubber industry each will contribute $2,500,000, while the balance will be made up by various related industries.

Shojiro Ishabashi, president of Bridgestone Tire Co., is expected to be the first president of the projected firm. A factory will probably be erected at Yokkaichi, in Mie Prefecture and, when completed, should be able to produce 30,000 tons of synthetic rubber in the first year of operation and reach 45,000 tons in the fourth year by increments of 5,000 tons yearly.

Technical cooperation from the major rubber companies in the United States will be sought.

Problem

A major automotive concern established exacting specifications for a radiator hose that would resist prolonged heating, water, anti-freezes and other engine coolants.



Solution

Firestone Tire & Rubber Company of Canada Limited used Polysar Butyl to produce a hose which met the specifications in every detail. Polysar Butyl's unique properties made it the ideal choice for the job and gave Firestone's customer a hose with inherent long service life.

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Malaya

Investors Reassured

On August 31, Malaya became an independent country within the British Commonwealth and has now been received as a member of the United Nations. As one of the world's largest sources of natural rubber and tin, occupying a strategic position in southeast Asia, this avowedly anti-Communist country will be drawing more than usual attention from the world. The West previously had received assurances of Malayan officials that an independent Malaya would take no action that would jeopardize foreign investments. Now Ismail bin Dato Abdul Rahman, the first Ambassador from Malay to the United States repeats that his government welcomes the investment of foreign capital in the rubber industry as well as in all other economical spheres; that it will guarantee freedom of movement of foreign capital (subject to foreign exchange control), and that it is prepared to enter into an agreement with any foreign government for the safeguard of foreign capital from appropriation without adequate compensation.

Trade with Red China

Communist China's tactics in the preliminaries to renegotiation of the rubber/rice deal with Ceylon have been watched in Malaya with scepticism and wishful thinking. Most rubber men correctly saw through China's apparent reluctance to renew the pact with Ceylon as a maneuver to make the most of her greatly improved bargaining position. Others hopefully looked for a breakdown in negotiations, to the benefit of Malaya. They were obviously encouraged by China's sudden increased interest in local rubber, especially as export figures for July revealed that 4,600 tons of Malayan rubber went to China, bringing the total for 1957 so far to 5,445 tons; the amount from June, 1956, when the ban on exports to Red China was lifted, to the end of 1956, came to 8,707 tons.

It has since become known that the Ceylon/China agreement has been renewed for another five years, but that the amount of rubber involved is 30,000, instead of 50,000 tons a year. Malaya, therefore, may hope to share in at least the remaining 20,000 tons. But certain Federation traders are putting their sights much higher; they talk of a potential export market to Communist China of more than 150,000 tons a year, and reason that since Malaya is buying a large amount of Chinese manufactures, China should reciprocate by getting most of the rubber she needs from Malaya.

The difficulty is, in their view, that Red China is not familiar with the buying and selling practices of Malaya, and that she is not permitted to station a purchasing representative here. They hesitate, they say, to press for the obvious solution: permission for buying agents from Red China to set up offices in Malaya, for fear of being branded pro-Communist. Yet unless the problem is solved in this way Malaya cannot expect any substantial increase in rubber business with China for, as a leading Kuala Lumpur rubber trader said, it is impossible to trade satisfactorily with a country that had no buying representative in Malaya.

Singapore rubber men contradicted these statements; lack of buying agents was not stopping Red China from buying rubber here, they declared; she could buy what rubber she wanted without difficulty; furthermore, as far as they knew, South Korea was the only country with a buying agent for rubber in Malaya.

An official of the Federation Ministry of Commerce & Industry is quoted as saying there was no need of traders fearing being branded Communists, and that if they were afraid to make their proposal individually, they could do so through their associations.

Saving the Industry

The sag in rubber prices and announcements of new and better synthetic rubbers make ways of protecting Malaya's rubber industry renewed topics of discussion.

Cheap labor and low production costs were stressed by H. T. Wong, secretary of the Associated Chinese Chambers of Commerce, as most important for the continued prosperity of the rubber industry in Malaya. He recommended speedy measures to eliminate all conditions which unnecessarily force up the cost of living and, hence, also wages and ultimately the cost of production.

The president of the Federation of Rubber Trade Associations, Heah Joo Seang, recently returned from a tour of Britain and America, urged the Federation Government to investigate the possibility of producing synthesized natural rubber. He was convinced that such a product would be superior to any natural rubber now being produced or likely to be produced in the future, and that it would open a new era in the rubber industry. A shocked plantation rubber industry lost no time in rejecting such an unthinkable plan. The Rubber Research Institute stated that there was no thought here of venturing in this direction.

Gan Teck Yeow, secretary of the trade mission to China and Japan last year, recommends bold action. He told a gathering of rubber traders in Kuala Lumpur that a free Malaya must increase its trade with neighboring countries irrespective of their systems of government; that the stability of the Malayan market must no longer depend on the "whims and fancies of big consuming countries."

Confidence in Malaya's future is apparently not so universal or so rock-fast as some public utterances would lead outsiders to believe. A recent item in the *Straits Times* calls attention to the fact, stressed in a British paper, that side by side with the trend to invest in rubber estates in Nigeria, is a new one toward abandoning the rubber industry altogether. In the past year several companies have invested in quite other fields; they have acquired manufacturing enterprises in Britain (unconnected with rubber), two of them after selling their rubber estates in Malaya. Sir Eric Macfadyen, head of Rubber Plantations Investment Trust, Ltd., is specifically mentioned as "gradually switching his plantation investments into British industrial stock."

Superior Processing Rubber

The Rubber Research Institute has for some time been experimenting with rubber latex to develop new products, among them Superior Processing Rubber. This type of rubber, specially designed for extrusion, it seems, is meeting with success; manufacturers in Britain, the United States, Australia, Portugal, Mexico, and South Africa are said to be taking it in quantity. Indeed, the demand is growing so that the RRI which now produces about 25 tons a month of this material, will not be able to satisfy orders if they continue to increase and will have to get other producers to handle them.

New Association Proposed

A new rubber trade association, which will offer full membership and voting rights to both Asian and European sections of the Singapore rubber market, has been proposed by the sub-committee of the Singapore Chamber of Commerce Rubber Association, appointed to study ways of improving relations between all sections of the market. The predominantly Chinese Rubber Trade Association of Singapore in preliminary discussions with the SCCRA, indicated that it favored the proposal in principle. If the proposal is adopted, the two organizations, while sponsoring the new association, will retain their individual identities.

Indonesia

Labor Troubles to Grow?

The problems of rubber estates in Indonesia are due to increase rather than decrease, recent news reports indicate. Besides old difficulties regarding estate titles, illegal occupation of estate lands, and a lack of European supervisory personnel that is becoming more serious since immigration regulations have been further tightened, new complications are apparently to be expected following the recent successes of Communists in municipal elections in Central and East Java.

Even before these developments, the rivalries of unions had been a source of labor troubles, and these are more likely to be intensified than eased now. Already the Communist Trade Union Federation has threatened to call a strike by 120,000 rubber estate workers in North Sumatra to back its demands for a bonus representing a month's wages. The Association of Rubber Estates offered a bonus equivalent to ⅛ of the workers' annual wage, but this was turned down.

Ceylon

Rubber-Rice Pact Renewed

After having kept Ceylon on the anxious seat for a suitable period, China has finally arranged a further five-year rubber/rice deal. Under the new arrangement, however, China will take only 30,000 tons of rubber (it was 50,000 tons in the first pact) annually and will supply 200,000 tons of rice in exchange, annually; no premium over world rubber prices will be paid by China, which, instead, undertakes to provide aid in kind to the value of 15,000,000 rupees a year, to assist Ceylon in rubber rehabilitation schemes.

Meanwhile Ceylon has removed the ban on export of sheet which was imposed in 1953 in order to maintain supplies for China.

Of late there has been much visiting by Iron Curtain country representatives in Ceylon and *vice versa*. From recent press reports it is clear that Russia has been making Ceylonese visitors very welcome and that at least some of the Ceylonese have been impressed not only by the friendliness of the Russians, but also by their peaceful aims as well as their economic and industrial progress and methods. Not long ago there was an exchange of ambassadors between the two countries.

India

Rubber Use Double by 1961?

India's consumption of raw rubber has increased 50% during the last five years and is likely to reach 60,000 tons by 1961, C. Stack, retiring chairman of the Association of Rubber Manufacturers in India, stated at a meeting in Calcutta early this year.

Official figures show that consumption in 1956 came to 31,405 tons, including 2,409 tons of synthetic rubber; in addition, the industry used 3,261 tons of reclaimed rubber, bringing the total for all rubbers during the year to 34,666 tons. It is estimated that manufacturers will use 35,732 tons of natural rubber in 1957 besides 4,351 tons of synthetic and 4,980 tons of reclaim, or 45,063 tons in all.

Production of natural rubber has increased by only 18% in the last five years; it totaled 23,444 tons in 1956, against 22,481 tons in 1955; it is expected to be about 27,000 tons this year, partly as a result of hormone treatment to stimulate production, and slaughter tapping of old rubber that is to be cut out in the current replanting scheme. This scheme, under which 70,000 acres are to be replanted in the next 10 years at the rate of 7,000 acres a year, has already made a good start,with accepted applications in the first year covering 6,200 acres. Since, however, no increase in production due to replanting can be expected before 1963, Indian rubber manufacturers will have to continue importing progressively larger quantities of rubber for some years to come, unless a

(*Continued on page 136*)

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From the day you decide on a Sargent, your savings start. Installed and working in record-quick time; continuous, completely automatic operation; simple, fool-proof, compact design that requires minimum operator attention and makes a Sargent the easiest dryer in the world for clean-out.

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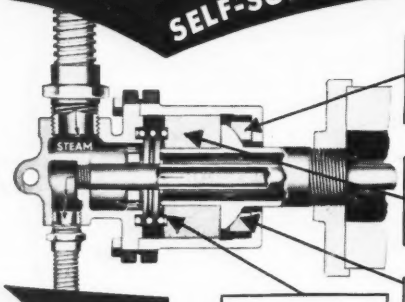

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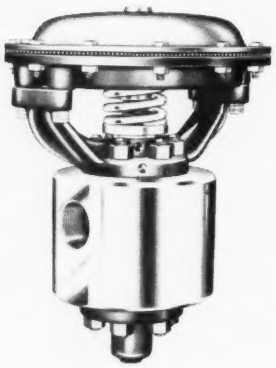
NEW EQUIPMENT

Sinclair-Collins Valves



Sinclair-Collins 6,000-pound, two-way control valve

A complete line of 6,000-pound, two- and three-way control valves, for use on plastic molding, ceramic forming, and similar equipment requiring extremely high operating pressures, has been announced by Sinclair-Collins Valve Co., Akron, O.

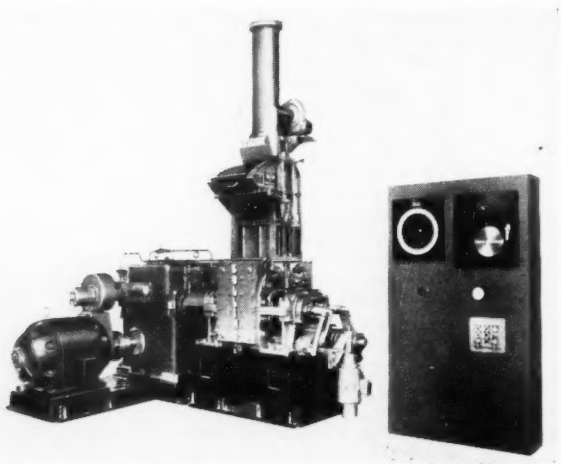
Said to provide fast response, leak-free operation plus smooth, shock-less opening and closing at maximum rated pressure, these valves feature bodies machined from solid aluminum bronze bar stock. According to the manufacturer, use of this stock, a material combining exceptional toughness with high tensile strength, eliminates valve body distortion under highest working pressures. In addition, Sinclair-Collins sleeve-type construction with a replaceable hardened stainless-steel seat sleeve insert in the valve body assures perfect alinement of valve stem and seats at all times. Stem seats are Stellite-faced.

In-service maintenance is reputed to be simplified by complete interchangeability of precision ground and lapped stems and seat sleeves. No special tools are required for service.

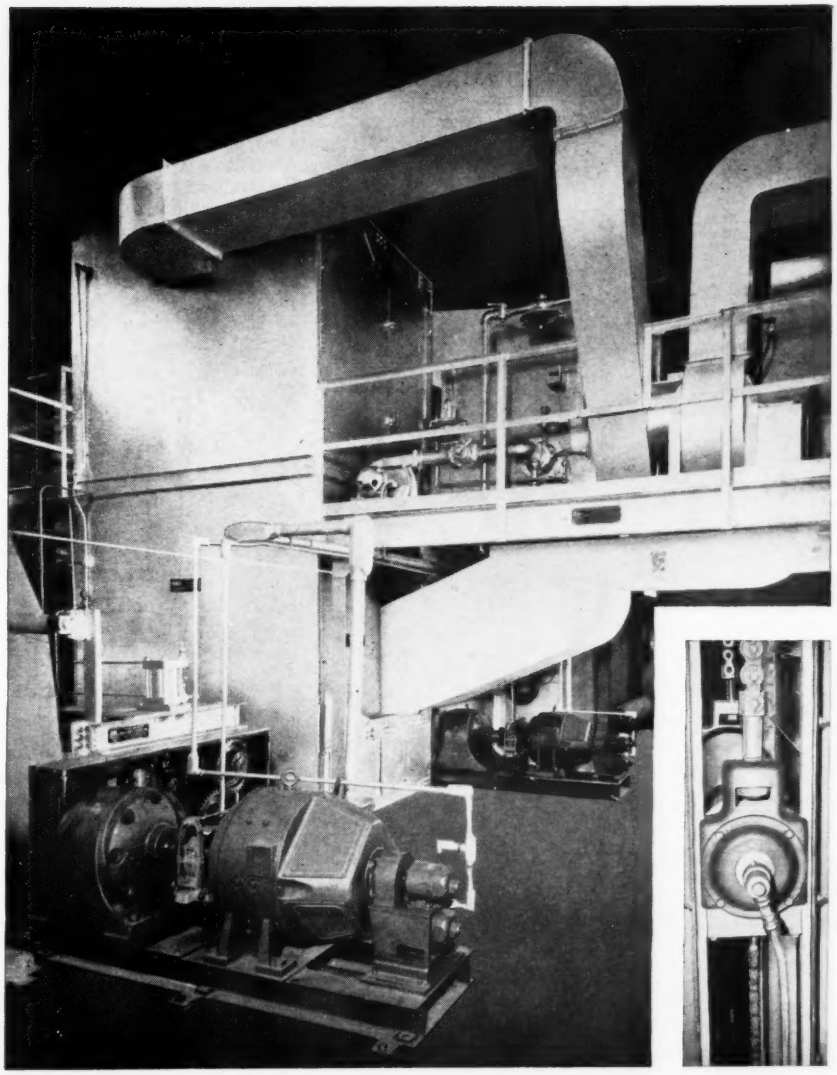
Available in ½- through two-inch NPT sizes and suitable for control of high pressure fluids, these 6,000-pound, two- and 3-way valves are designed for use with Sinclair-Collins cycle controllers, with any applicable pneumatic or electro-pneumatic cycle control device, or for manual operation. The valve diaphragm is actuated by 35 to 40 psi. air.

Stewart Intensive Mixer

New to Stewart Bolling's line of intensive mixers is the No. 1-B Model for medium small production and major laboratory work with rubber and plastics. Dimensions are: overall height—



Stewart Bolling's No. 1-B Mixer



Within the first day of startup, full width nylon tire cord processed in this 30-yard-per-minute, 14,000-pound-tension **IOI** Rollevator® Oven*, was made into aircraft tires meeting all qualification tests.

The Rollevator® roll automatically moves up and down within the oven, in direct relation to line speeds. Thus, *at any line speed, heat-exposure* time of the nylon is held *constant* at a constant temperature setting and at constant tension.

Rollevator® Oven* hot stretches nylon tire cord at constant optimum temperature, constant time and constant tension, at variable line speeds

The **IOI** Rollevator® Oven* is the answer to more uniform hot stretching of nylon with greater production efficiency. Simple and automatic in operation, it practically eliminates costly shutdown and repair time. When the line is stopped the Rollevator® roll automatically lowers out of the heat zone, eliminating the need for quick cool purging of the oven and the time and expense involved in reheating the oven when starting up again. Its low operating cost combined with low initial cost assures you of lower production cost. An **IOI** sales engineer will be glad to give you complete information about the Rollevator® Oven* and to discuss your requirements for any system from 3 to 100 yards per minute.

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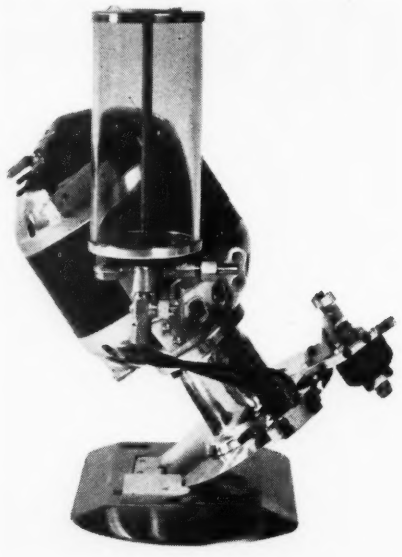
11 feet; overall width (without control panel)—eight feet. Mixer capacity is 1,200 cubic inches, and temperature range to 500° F. Batch sizes range from 24 pounds, 1.00 gravity, through 45 pounds at 2.00 gravity. This new mixer has all Stewart Bolling features which include anti-friction rotor journal bearings, split end frames, and spiral-flow sides which heat or cool with optimum efficiency.

Found only on Stewart Bolling's largest mixers, but available on this new model, is the compound-type drive which permits high rotor speeds, and power application, but requires little space. The Model 1-B is equipped with the company's motorized discharge door, giving fast, positive action on door openings and closing. All surfaces coming on contact with materials are chrome-plated.

This machine is designed and built by Stewart Bolling & Co., Inc., Cleveland, O.



Eastman's new portable skiving machine

Rubber Skiving Machine

A new portable rubber-skiving machine, claimed to be the first and only machine that can satisfactorily replace hand-skiving, has been announced by Eastman Machine Co., Buffalo, N. Y. The machine simultaneously cuts and skives slabs (up to ½-inch thick) of cured, uncured, and synthetic rubber and foam, making a uniformly smooth and accurate cut, it is claimed. The bevel is fixed at an angle of 35 degrees off the horizontal. The machine features a moistening device that can be controlled for the proper lubrication of the knife, as well as an automatic knife-sharpener that renews the knife edge as the machine is in operation.

Richardson Bins for Rubber Pellets

A bin system said to prevent the adhesion of rubber pellets while storing or handling them has been announced by Richardson Scale Co., Clifton, N. J. Called stack bins, the unit consists of a vertical series of bins, each of which holds 2,000 pounds of pellets. Pellets are transferred from bin to bin by pneumatic discharge gates which form the bottoms of the individual bins. The gates are actuated by flow-control switches and protected by electrical interlocks.

Each bin is a separate steel unit measuring six feet in length, five feet in width, and 37 inches in height. The discharge gate is mounted on rollers and operated by a pair of pneumatic pistons with a stroke length equivalent to the bin length. Tracks for the rollers extend beyond the bin for the length of the

(Continued on page 126)

A specially "engineered" nylon fabric for combining with butyl rubber was developed by Wellington Sears for the Carlisle Tire & Rubber Div., Carlisle, Pa. Wellington Sears supplied only the base fabric—not the finished piping.

With a new kind of pipe hauling water for them, farm owners may soon have irrigation usually considered way beyond their reach. Made of a specially woven nylon fabric in combination with butyl rubber, this pipe eliminates much of the cost of equipment, ditching, and other ordinary details, and provides an easily assembled, easily knocked down water carrier. It is durable, water tight, resists erosion and eliminates water losses due to seepage and evaporation. It costs less, carries more. And it can be moved easily from place to place: a 50-foot link weighs approximately 50 pounds.

Whether it works on the farm or in the factory, fabric is doing a bigger and bigger job these days. The nylon used in this irrigation system is just one of the many fabrics made for industry by the mills of West Point Manufacturing Company, and supplied by Wellington Sears. It represents over a century of experience in industrial textiles of all kinds, a record of service which means problem-solving help for you, on call. Just let us know. For informative booklet, "Fabrics Plus," write Dept. H-10.

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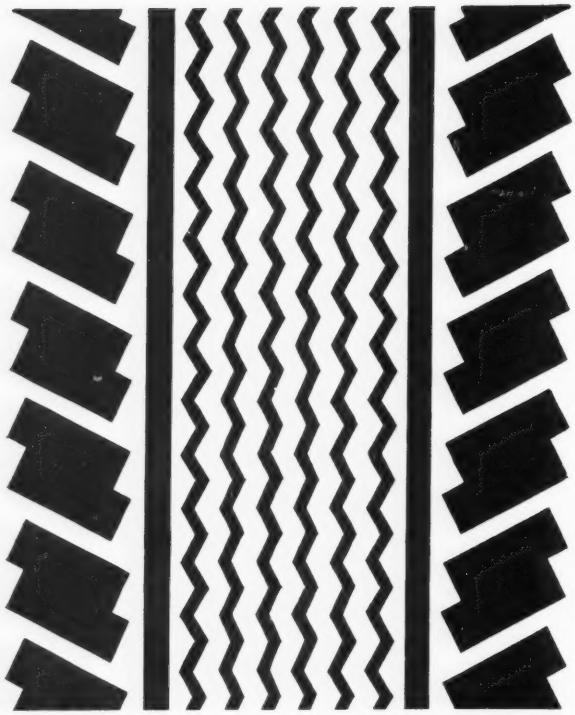

Let's talk tires

"Bag-O-Matic" presses are enjoying increased popularity in the tire industry. But, the high operating temperature of these presses puts severe demands on rubber lubricants. Lubricants must perform efficiently under these new conditions. That's why you should consider UCON rubber lubricants in "Bag-O-Matic" presses.

UCON Rubber Lubricants . . .

- *insure proper forming of the tire*
- *give clean release*
- *increase bladder life*

The low volatility of UCON rubber lubricants prevents sticking. So, the quality of the finished tire is improved. Production loss due to cleaning operations is also reduced because UCON rubber lubricants retard the formation of gummy deposits on equipment. And, UCON rubber lubricants are available in both *water-alcohol* soluble and *gasoline* soluble series.

UCON rubber lubricants can help you make a better tire. Write for samples and further information.

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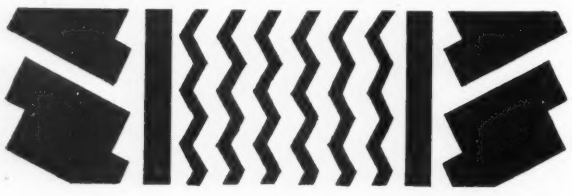


NEW MATERIALS

Chemlok 607 and Chemlok 614

Chemlok 607, formulated and supplied by Lord Mfg. Co., Erie, Pa., is a clear colorless liquid used as an adhesive to bond unvulcanized silicone rubber to various metals, glass, several types of textile fabrics, and to plastics. The broad versatility of Chemlok 607 suggests its utilization whenever silicone bonding is encountered. This adhesive may be considered in bonding specialty elastomers. It is also used as a primer for bonding cured silicone rubber to metal utilizing the Chemlok silicone paste adhesive, Chemlok 614.

More detailed descriptions and applications of Chemlok 607 and Chemlok 614 are given in the company's bulletins 6005, 6501, and 6004A.

Silastic RTV 501 Silicone Rubber

A new room-temperature vulcanizing silicone rubber has been introduced by Dow Corning Corp. Indentified as Silastic RTV 501, it is recommended for encapsulated electric and electronic parts and for general potting, sealing, and calking applications.

Silastic RTV 501 has a long shelf life in the unvulcanized state, is easy to handle and blend, and retains its rubber-like properties over a temperature span of from —70 to as high as 500° F.

Silastic RTV 501 may be mechanically or manually mixed as long as three hours before application, in the proportion of 25 parts to one part Silastic Catalyst A by weight. Both ingredients have a viscosity of about 60,000 centistokes, or the consistency of a heavy fluid.

Vulcanization takes place within 24 hours at room temperature. The compound is completely stabilized after 48 to 72 hours. Moderate heating (up to 200° F.) will accelerate curing in most cases.

Typical properties of Silastic RHV 501 have been reported as follows:

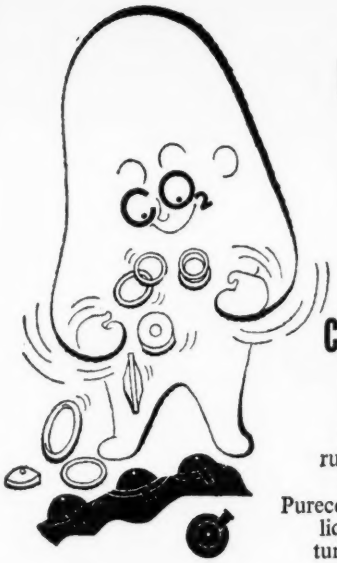
Before catalyzing:

Viscosity, centistokes	60,000
Color	white
Specific gravity	1.15

After vulcanizing for 24 hours at 77° F:

Color	pale tan
Durometer hardness, Shore A scale	30
Tensile strength, psi	230
Elongation, %	250
Brittle point, °F	−100
Shrink, linear, %, after	
3 days at 77° F	0.58
6 days at 77° F	0.78
14 days at 77° F	1.08
Water absorption, %, after 70 hours immersion at 212° F	−1.40
Electric strength, volts per mil	460
Dielectric constant at	
10^2 cycles	2.6
10^5 cycles	2.5
Dissipation factor at	
10^2 cycles	.01
10^5 cycles	.003

Data sheet 9-377, giving full details on this material, is available from the company.



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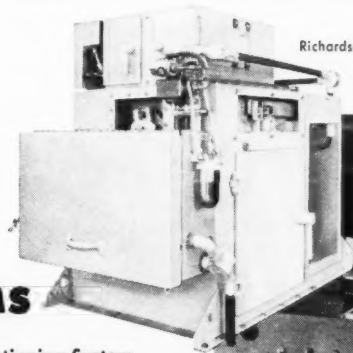
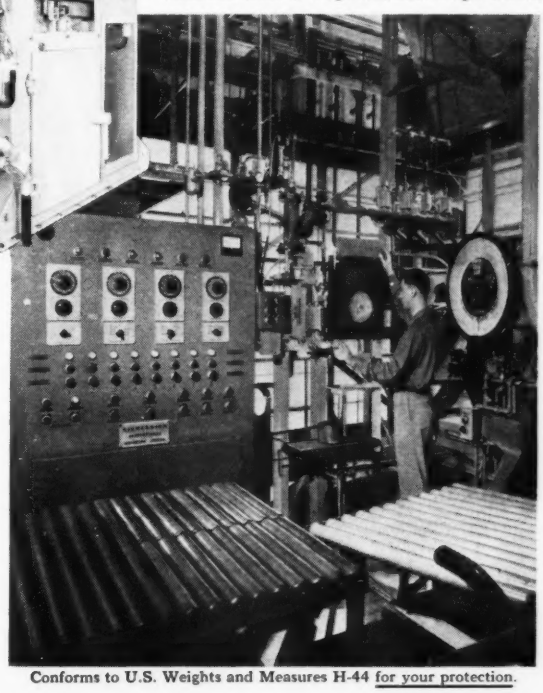
HOW Richardson Solves CARBON BLACK HANDLING PROBLEMS



Richardson Model E-50 Bulk Weighing Scale

Richardson Select-O-Weigh Automatic Weight Control



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Fully automatic control of feeding of carbon black to the scales and efficient, accurate weighing of the material is assured. It provides accuracy and reliability through a complete system of electronic checks on each phase of handling . . . all from a remote location if desired.

. . . With The Richardson E-50 Bulk Scale.
This completely enclosed unit eliminates dust—provides clean and healthy working conditions. The knife-edge beam system gives positive accuracy of each weighing to ± 0.1%. No packing or caking of material on inside walls.

. . . With The Specially Designed Screw Feeders.
Constant and uniform flow of carbon black to the scale is assured. No flushing, jamming or dusting of the material.

A Richardson Select-O-Weigh system for automatically handling carbon black is the answer to improved product quality, clean operation and lower production costs. Call or write for prompt, free information.

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R C Rigid Plastisol

A rigid plastisol compound which fuses to a Shore A hardness of 100 has been introduced by the Rubber Corp. of America, Hicksville, N. Y. New applications are possible since the compound couples low viscosity with high hardness when fused. R C Rigid Plastisol offers excellent rotational casting performance, it is said.

Some properties of R C Plastisol are as follows:

Viscosity, Brookfield, 20 rpm. at 77° F.	7500 cps.
Solids, %	100
Specific gravity, at 25° C. (no filler)	1.2
Color	unlimited
Storage stability	excellent

Fused Film Properties

Shore A hardness	100 minimum
Tensile, psi.	2700
100% Modulus, psi.	1800
Elongation	200
Tear strength, Graves	470

Silicone Rubber SE-555U

Exceptional processability is a feature of a new high-strength silicone rubber, SE-555U, recently added to the standard product list of the silicone products department, General Electric Co., Waterford, N. Y. SE-555U is a Class 500 silicone rubber compound possessing excellent elongation and tear strength with moderate compression set, it is claimed. This easy-processing compound bands immediately on the mill and can be fabricated by all of the commonly used methods. It can be freshened excessively without becoming sticky, and it can be extruded several days after freshening. With excellent mechanical properties, low water absorption characteristics, and good oil resistance, SE-555U is suggested for molded and extruded seals and gaskets and a wide variety of mechanical and air frame applications.

Some product properties of SE-555U are reported as follows:

Cured compound (Press cure 10 min. @ 275° F. and oven cure)

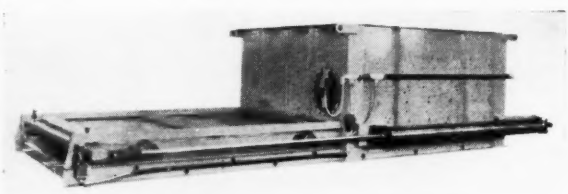
Oven cure	1 hr./ 300° F	8 hr./ 375° F	3 hr./ 400° F
Color	gray	gray	gray
Specific gravity	1.18	1.18	1.19
Hardness, shore A	45–5	50–5	50–5
Tensile strength, psi.	1600	1550	1550
Elongation, %	850	650	650
Tear strength, Die B, pi.	250	200	200
Compression set, Method B, % 70 hr./300° F.	—	55	60
Linear shrinkage, % approx. (on ASTM test slabs)	2.5	3.5	3.5

Bins for Pellets

(*Continued from page 122*)

gate. The bins have straight sides to prevent the sticking of the pellets. A seal is located at the slide opening to keep the pellets from catching on the slide during discharge.

Pellets, coated with talcum, are delivered from the pelletizing operation by Fuller pneumatic conveyors to a feeder above the top bin in the stack.



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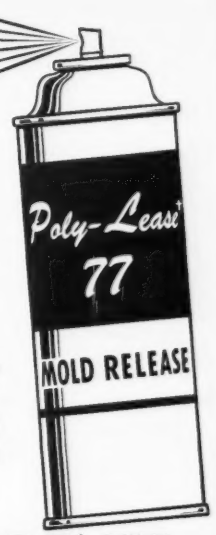

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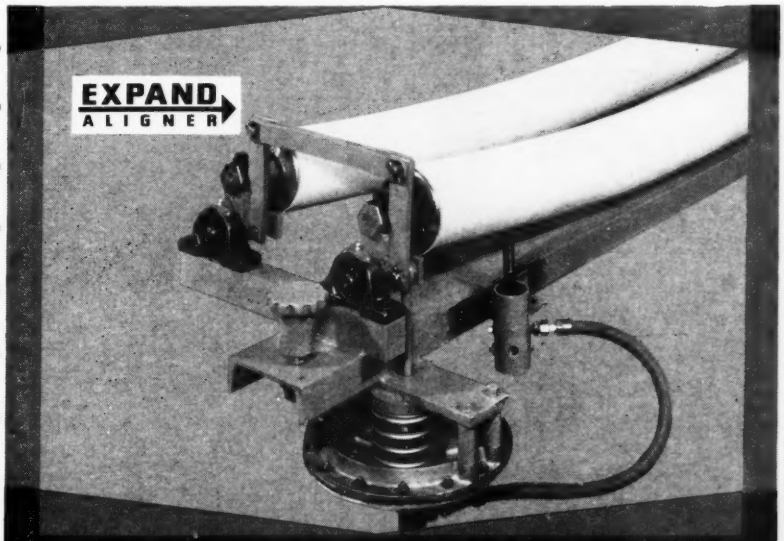

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TECHNICAL BOOKS

BOOK REVIEWS

"Rubber—Fundamentals of Its Science and Technology." By Jean LeBras. Translated from the French by Irene E. Berck. Chemical Publishing Co., New York, N. Y. Cloth cover, 6 by 9 inches, 464 pages. Price $12.

As explained by the author in the foreword, this book is derived from material presented at a training course for rubber engineers and technicians at the French Rubber Institute in Paris. It has been translated into German and now into English, and it appears that it will be used by students in various European countries in preparing for examinations for the International Diploma in Rubber Technology awarded by the International Education Committee.

Since this book is meant for people who have recently entered or who plan to enter the rubber field, it deals with fundamental aspects of the subject. It treats each branch of the rubber science and technology sufficiently for the average beginner and provides a good general education on rubber.

In the first chapter on "General Aspects," Dr. LeBras discusses the early history of rubber, then tells of the establishment of plantations, the growth of the rubber products industry with the increasing automobile market, the development of rubber reclaiming, and the production of synthetic rubbers under the impetus of war restrictions.

The next several chapters deal with the following aspects of natural rubber: sources and preparation; composition and properties of latex; physical and chemical properties; composition and structure; vulcanization agents and their physical effects; compounding; processing; direct use of latex; and theoretical considerations involved in vulcanization, acceleration, activation, reinforcement, oxidation, and elasticity. The whole gamut of synthetic rubber and rubber-like materials is then dealt with, including description of manufacture, likely chemical structures, advantages and disadvantages when compared to natural rubber, and uses.

Information is also included on hard rubber, reclaiming methods and properties of reclaimed rubber, and chemical derivatives of rubber. Physical test methods and applications of rubber complete the subjects covered.

The style and content of this book are such that many in the rubber industry will read it from cover to cover. Although designed essentially for newcomers to the industry, those already in the field will find it provides a valuable refresher course.

A bibliography is included which lists books devoted to rubber published in the United States, England, France, Germany, Belgium, Holland, and Brazil. A list of periodicals devoted to rubber published in various countries of the world is also included.

C. V. LUNDBERG

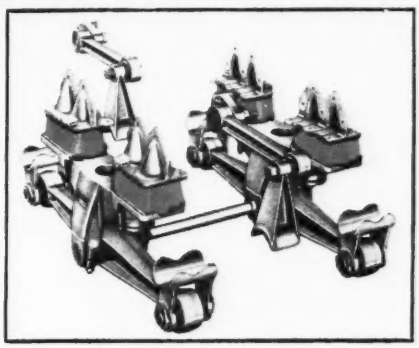
"Quality Control and Statistical Methods." Second Edition. By Edward M. Schrock. Reinhold Publishing Corp., New York, N. Y. Cloth cover, 6 3/16 by 9 5/16 inches, 260 pages. Price $6.75.

This is the second revised edition of a book whose purpose is to introduce the reader to the methods of modern statistical quality control.

The first four chapters are devoted to the development, organization, use, and applications of modern statistical quality control.

Chapter 5 gives a good discussion of the statistical meaning of the words, "precision" and "accuracy." Unfortunately, as the author points out, most scientists seem to have a fuzzy idea of the true meaning of these words.

Central tendency, measures of dispersion, skewness and kurtosis are next discussed. At this point the book begins to suffer from an almost total lack of statistical theory. From



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Enjay Butyl has proved to be the answer to problems in many fields of industry. It may well be able to cut costs and improve the performance of *your* product. Low-priced and immediately available, Enjay Butyl may be obtained in non-staining grades for white and light-colored applications. Get all the facts by contacting the Enjay Company. Complete laboratory facilities and technical assistance are at your service.

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a strict theoretical point of view the author's definition of σ is incorrect. The symbol σ is usually understood to be a population value, and the mean used in defining it should be the population mean μ rather than the author's $\bar{X}$. Furthermore, although the effect of skewness and kurtosis on a normal distribution is illustrated, no mathematical definitions of these terms are given.

The following chapter on frequency polygons, histograms, and special graph papers is good.

The "how-to-do-it" side of statistical quality control charts is presented in chapters 8 to 17. In chapter 16 notational difficulties arise, and the relation between the author's σ, s, and S is not clearly explained.

Fisher's t test and Snedecor's F test are introduced (though not by name) in chapter 19. Here the user will have to grapple with the concept of "degrees of freedom," and the rather special case discussed by the author will be of little help should he wish sometime to expand his statistical techniques to include χ^2 problems.

Chapter 20 presents some non-parametric tests, the sign test, and Wilcoxon's signed rank tests.

Chapter 21 and 22 are devoted to acceptance sampling and sequential analysis, respectively. Standard sampling tables such as the Dodge-Romig and the Army Services Forces Standard Inspection Procedures are discussed. The Dodge plan for sampling inspection of continuous production is also given in chapter 21 and should be of considerable use in the chemical and rubber industries.

The concluding chapters are on least squares, correlation, and analysis of variance. The author presents a scale of correlation values which must not be taken too seriously. Generally speaking, the correlation coefficient r, as such, has little real use in the physical sciences. The chapter on analysis of variance is very meager. The concept of "interaction" is not adequately explained.

This is a brief and elementary book on statistical quality control and industrial statistics. The mathematical background necessary to read it is high-school algebra.

NEW PUBLICATIONS

Publications of Dow Corning Corp., Midland, Mich.:

"Silastic LS-53." 9-379. 2 pages. The physical properties, advantages, and chemical resistance of the company's special-purpose fluorosilicone rubber are covered in this technical data sheet.

"Silastic 651." 9-374. 2 pages. The physical properties electrical properties, molding and curing, and effects of different cures and aging on the company's general-purpose 50-durometer hardness silicone rubber are dealt with in this technical data sheet.

"Silastic 916." 9-373a. 1 page. The typical properties and advantages of the company's high-strength silicone rubber are included in this technical data sheet. It is claimed to be the first silicone rubber available that combines high strength with the thermal stability characteristic of silicone rubber.

"Silastic 2067." 9-375. 1 page. The typical properties, advantages, and molding and curing of the company's 60-durometer hardness silicone rubber appear in this technical data sheet. The compound is used to make 60-durometer rubber. parts with good strength and low compression set.

"Silastic Silicone Rubber." 4 pages. Electronic and electrical applications of Silastic which combine the mechanical properties of rubber with excellent dielectric properties are described here. Typical physical and dielectric properties are included as well as a variety of illustrated applications.

"Silastic Catalyst 2084." 9-380. 2 pages. This technical data sheet gives the limitations, typical properties, uses, and vulcanization data of Silastic Catalyst 2084, a masterbatch containing 20% ditertiary butyl peroxide mixed with Silastic gum and inert filler. It is claimed to be an effective vulcanizing agent for vinyl-containing silicone rubbers.

"Dow Corning Primers and Adhesives for Silastic." 4-611a. 2 pages. Dow Corning Primers 796, A-4004, and A-4014 and Adhesives A-4000, C-269, C-271, and C-274 are listed with information such as surfaces for which they are prepared, how used, cure, bonds Silastic to listed materials, how applied, how cured, and usable temperature ranges. This latter information is also given for Silastic 6-127.

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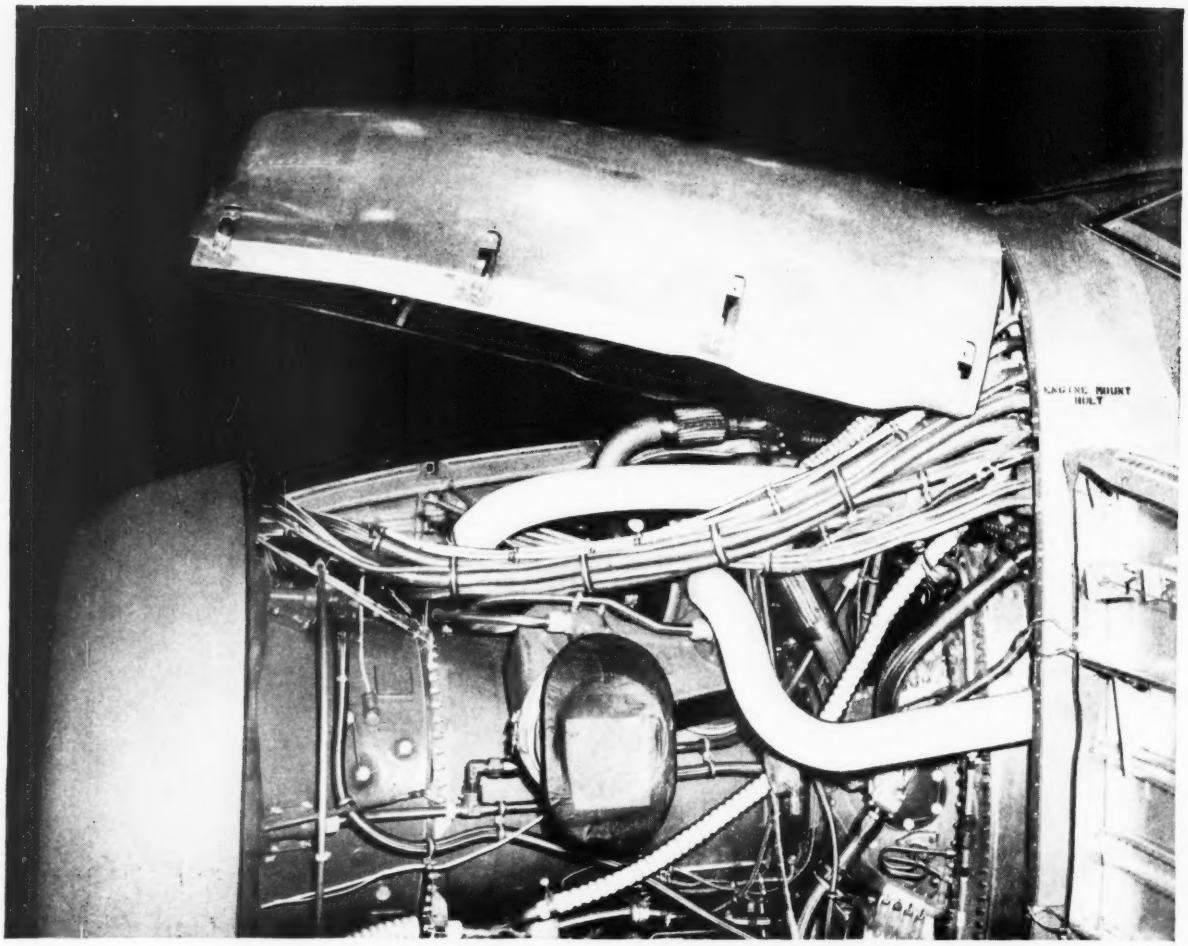

SILASTIC 432 Base

Makes Hose Serviceable From –100 to +500F

TYPICAL PROPERTIES OF
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MADE WITH SILASTIC 432 BASE

	Cured 24 hrs at 480 F	Aged 24 hrs at 600 F
Temperature range, degrees F	—100 to	+500
Specific Gravity		1.27
Hardness, durometer	55	60
Tensile Strength, psi	850	770
Elongation, %	250	200
Compression Set, percent, 22 hrs at 300 F	20	18

Properties obtained on ⅛" ASTM slabs or buttons, molded 5 minutes at 240 F.

The compounding of stocks with superior physical properties for hose, ducts and tubing is easier with Silastic* 432 Base. This partially-compounded silicone rubber gum requires no bin aging after compounding, is easy to calender onto glass, dacron or nylon and can be dispersed in solvents for spread, dip or flow-type coatings. All compounds made from Silastic 432 Base retain remarkable resistance to extreme temperatures and abrasion. They have high tensile strength, good elongation and low compression set.

Do you want the recipe? *Complete instructions for compounding Silastic 432 Base for hose, duct and tubing compound is yours for the asking at the nearest Dow Corning branch office.*

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"Oakite Drycid." Oakite Products, Inc., New York, N. Y. 2 pages. The properties and uses of Oakite Drycid, the recently introduced powdered acid scale and rust remover, are described in this service report. The convenience inherent in shipping, storing, and using a powdered rather than liquid acid; the lack of bothersome acid fumes; and the material's increased safety on various metals, are emphasized.

"Heat Sensitization of Hycar Latex." B. F. Goodrich Chemical Co., Cleveland, O. 8 pages. Properties, formulations, and applications of the company's Hycar latex compounds are described in this bulletin. A list of coagulants and protective colloids is provided. Procedures of heat sensitization of Hycar formulations are given with their particular applications.

"The Lemol Polyvinyl Alcohols." Borden Co., Chemical Division, New York, N. Y. 23 pages. The Lemol polyvinyl alcohols, a series of unique water-soluble resins produced by hydrolysis of polyvinyl acetates synthesized to rigidly controlled molecular weights and configurations, are covered in this bulletin. Arranged in three parts, "Specifications, Solutions, and Compounding," "Properties of the Lemols," and "Industrial Uses of the Lemols," the booklet lists such uses as those found in compounding adhesives; sizing, saturating, laminating, and coating paper; finishing fabric; sizing yarn; emulsifying many oils, plasticizers, solvents, and waxes, and molding rubber-type products.

"Butyl Oleate Technical." Harwick Standard Chemical Co., Akron, Ohio. 1 page. This technical bulletin lists the chemical composition, the chemical and physical properties, and the recommended uses of butyl oleate, a liquid low-temperature plasticizer for natural and synthetic rubbers.

"Evaluation of Chlorinated Paraffin as a Secondary Plasticizer for Polyvinyl Chloride." Diamond Alkali Co., Cleveland, O. 15 pages. This informative technical bulletin, prepared expressly for manufacturers of products utilizing PVC resins, presents comprehensive yet concise data on the evaluation of two commercial chlorinated paraffins, Chlorowax 40 and Chlorowax LV, as secondary plasticizers for use with polyvinyl chloride resins. Specific properties of each plasticizer covered are compatibility, hardness, low-temperature flexibility, and 100% modulus. Compatibility and plasticizer efficiency for both chlorinated paraffins are indicated, and their respective efficiencies compared for stocks of equivalent hardness and 100% modulus. Low-temperature flexibility is also shown, and these results are compared on stocks having equal values for hardness and 100% modulus. Test results are clearly illustrated in a series of 11 tables and seven graphs.

"Vibrasorb V-Belt." B. F. Goodrich Industrial Products Co., Akron, O. 1 page. This catalog sheet explains how the patented Vibrasorb belt solves vibration problems for air conditioning units, forced air furnaces, window and attic fans, and other belt-driven appliances. Information needed for drive design is included.

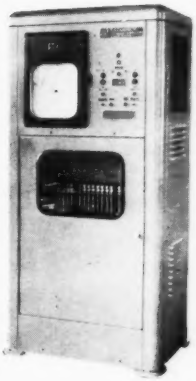
Publications of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

"Weathering of Neoprene-Coated Nylon Fabric." B. W. Fuller. Report BL-327. 8 pages. This booklet considers the formulations, the testing, and results of neoprene-coated nylon fabric in various weathering environments. Rates of deterioration and erosion factors of weathering are included.

"Weather Resistant, Low-Cost Colored Blends of Hypalon 20 and Natural Rubber." B. W. Fuller. Report BL-328. 4 pages. This pamphlet lists in a table the effect of clay and plasticizer extension on Hypalon/rubber blends, including the formulations and physical properties. Various advantages and applications are suggested.

"Hypalon 20 for Food Conveyor-Belt Covers." B. W. Fuller. Report BL-329. 4 pages. This folder gives the formulation of a test specimen, the compared test results, and the advantages of Hypalon 20, a specially formulated compound which resists surface deterioration encountered in food conveyor-belt applications.

for PRODUCTION and LAB TESTING



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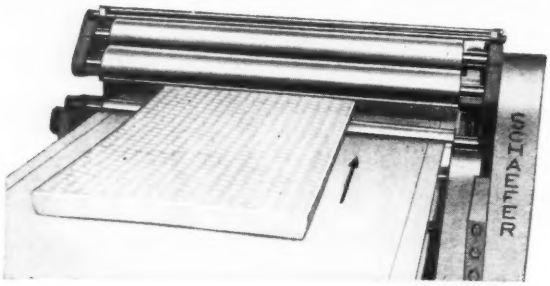

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Publications of Union Carbide Corp., silicones division, New York, N. Y.:

"Let the Silicones Man Help Solve Your Problems." Bulletin 447. 4 pages. This folder describes briefly the following silicones put out by the company: water repellents; oils and oil emulsions; electrical insulating resins; silicone rubber gum stocks and compounds; miscellaneous useful silicones; silicone intermediates and monomers.

"K-1516 Conductive Silicone Rubber Compound." 8 pages. The conductive silicone rubber X-1516 is no longer an experimental product; so now it is known as K-1516. Its properties, uses, features, and characteristics are covered in this bulletin. Listed also are tables showing the effect of applied electrical loads, overworking, flexing, and stress on this material; recommended catalysts and curing cycles; typical properties; and blends of K-1025 or K-1035 and K-1516.

Publications of the Thiokol Chemical Corp., Trenton, N. J.:

"Evaluation of Butyl Accelerators— Quinoid Type Cure." Bulletin 100-3. 16-pages. This butyl technical service bulletin describes the evaluation of p-quinone dioxime (GMF) and p-dibenzoyl quinone dioxime (Dibenzo-GMF) as efficient accelerators for butyl rubber. An introduction, test procedure, conclusions, and tabled results are given.

"Study of Ester-Type Low-Temperature Butyl Plasticizers." Bulletin 103. 12 pages. This butyl technical service bulletin presents an evaluation of 12 low-temperature ester-type plasticizers in butyl rubber. The purpose of study, the plasticizers tested, an introduction, the test procedure, and summary are included.

Publications of the Goodyear Tire & Rubber Co., Akron, O.:

"Compounding Study: Permanent Type Plasticizers in Pliovic AO Plastisols." Tech-Book Facts Bulletin 57-200. 3 pages. A compounding study, this bulletin evaluates 16 commercially available permanent-type plasticizers that find application in plastisols. Supplied are data outlined in a table, to assist in choosing the plasticizer best suited for a particular application.

"Compounding Pliovic S70." Tech-Book Facts Bulletin 57-95. 2 pages. This bulletin describes the physical properties, the effect of plasticizer concentration on physical properties, and the variation of plasticizer selection of Pliovic S70, a general-purpose, medium viscosity, polyvinyl chloride resin, and of Pliovic DB80V and Pliovic DB90V, higher molecular weight resins.

"Guarding Calender Roll Bites." Data Sheet D-449. National Safety Council, Chicago, Ill. 6 pages. This publication discusses the safeguarding of inrunning calender roll bites in the rubber industry. Methods are detailed, with photographs and sketches providing the illustration.

"New Boston High Tension Belts." Boston Woven Hose & Rubber Co., Boston, Mass. 4 pages. This revised folder gives up-to-date information and specifications on the company's complete line of high tension belts.

"ASTM Standards on Rubber Products." March, 1957. American Society for Testing Materials, Philadelphia, Pa. 832 pages. Price, $7. This year's compilation of rubber products standards contains 100 tests, 29 recommended practices, six definitions, and 38 specifications. Of these, 32 are new or recently revised. Among the topics covered are processibility tests, chemical tests of vulcanized rubber, physical tests of vulcanized rubber, aging and weathering tests, low-temperature tests, synthetic elastomers, automotive and aeronautical rubber, packing and gasket materials, hose and belting, tape, insulated wire and cable, hard rubber, latex foam, sponge and expanded cellular rubber, adhesives, and nonrigid plastics.

"Seiberling Product and Data Book." Seiberling Rubber Co., Akron, O. 92 pages. This loose-leaf, thumb-indexed illustrated book (1957 edition), meant primarily for truck tire dealers and truck fleet operators, deals with structural advantages and descriptions of the company's truck, special-duty, and passenger tires, truck tubes, tire care, batteries, rims, load distribution, valves, etc., and gives also tables of weights and measures.

MARKET REVIEWS

Natural Rubber

The August 16-September 15 trading period continued on its steady quiet way in natural rubber market activity. Spot prices in New York, registering slightly over 2¢ a pound high-low price differental, have followed the trend of previous periods. Contracts traded during this period on the New York Commodity Exchange rose to 16,420 tons from a previous tonnage of 14,870. The anticipated increase following Labor Day failed to materialize.

Rubber futures continued gradually to decline under the influence of large unsold stocks in the Far East. The spot prices registered the sharpest decline, but even with milder drops, the March, May, and July options reached new life of contract lows. Behind this evenness of price stability is a situation of fairly good balance between supply and demand the world over that has eliminated any possibilities of quick profit through speculations or need of hedging against rapidly changing price levels. Indicative of the good balance in the market is the fact that while trading volume has been small, and all parties connected with the rubber business have been anxious to increase activity, offers to buy even considerable quantities if given slight price concession have generally been rejected. There is, furthermore, no reason to expect this statistical balance in the rubber picture to be altered to any marked degree in the coming months.

Contributing to the world rubber market price decline was the announced decision of the Government of Ceylon to lift the ban on the export of sheet rubber. The Ceylon Government has decided to allow shippers to sell sheet rubber in the open market because the government had bought enough stocks to fulfill its annual commitment to China. The ban on free market sales will not be reimposed until the end of the year. The full market effect of this move cannot yet be accurately assessed.

Traders studied the report from Colombo, Ceylon, that the government there was considering turning to West Germany for a rubber pact, since reports that Communist China may not extend the pact which has been in effect for several years.

August sales, on the New York Commodity Exchange, amounted to 18,540 tons, compared with 14,980 tons for July; none on the Rubber-Standard Contract. There were 22 trading days during August; 21 during the August 16-September 15 period.

Week-end closing Commodity Exchange futures prices for the Rex Contract follow:

REX CONTRACT

	Aug. 16	Aug. 23	Aug. 30	Sept. 6	Sept. 13
Sept.	32.00	31.75	30.81	30.55	29.65
Nov.	31.95	31.65	30.81	30.55	29.70
1958					
Jan.	31.90	31.59	30.81	30.55	29.70
Mar.	31.80	31.45	30.81	30.55	29.75
May	31.70	31.30	30.81	30.55	20.70
July	31.50	31.10	30.71	30.50	29.70
Sept.	31.30	30.95	30.61	30.45	29.70
Total weekly sales, tons	5,090	3,080	5,410	2,270	2,850

On the physical market, RSS #1, according to the Rubber Trade Association averaged 31.06 per pound for the August 16-September 15 period. Average August sellers' prices for representative grades were: RSS #3, 31.83¢; #3 Amber Blankets, 29.01¢; and Flat Bark, 21.69¢.

	Aug. 16	Aug. 23	Aug. 30	Sept. 6	Sept. 13
RSS #1	32.13	31.63	30.88	30.63	29.88
2	32.00	31.50	30.88	30.50	29.75
3	31.88	31.38	30.66	30.38	29.63
Pale Crepe #1 Thick	36.50	35.88	36.13	30.38	34.50
Thin	34.50	33.88	34.13	....	33.25
#3 Amber Blankets	29.00	29.00	28.88	28.88	28.25
Thin Brown Crepe	28.75	28.75	28.63	28.63	28.00
Standard Flat Bark	21.63	21.63	21.75	21.75	21.38

Synthetic Rubber

With industry shutdowns for vacations about completed, new rubber consumption in the United States during August climbed to 123,221 long tons, as compared with the 109,660 long tons consumed in July, according to the monthly report of The Rubber Manufacturers Association, Inc. Of this 123,221 tons, synthetic rubbers accounted for 78,425 tons, as compared with 69,977 tons a month ago, and amounted to 63.7% of the total new rubber consumed in August. Natural rubber consumption in August amounted to 44,796 tons, against 39,683 tons in July.

By types synthetic rubber consumption in August was reported as follows: SBR, 65,590 tons, against 59,117 in July; neoprene, 6,464, against 5,125; butyl, 4,397, against 4,192; and nitrile, 1,974, against 1,543.

Production in August according to types, as compared with July, amounted to: SBR, 76,225, against 67,796; neoprene, 9,033, against 8,591; butyl, 5,455, against 1,972; and nitrile, 2,760, against 2,592.

The outlook for the remainder of 1957 continues good. Harvey S. Firestone, Jr., on the eve of his departure for Europe to inspect his firm's factories and sales operations abroad, said on September 25 that the outlook for the tire industry in particular indicates new sales records possible. Tires sales of 108,000,000 in 1957 are expected to be even higher in 1958 at 111,000,000.

The September 7 issue of *Business Week*, in a feature article on the synthetic rubber industry, estimated the demand for synthetic rubber at 1,035,000 tons in 1958, 1,200,000 in 1960, and 1,300,000 tons in 1962. The point was also made here that although the SBR producers had absorbed labor costs during the last couple of years, some price increase would appear to be necessary, at least by early 1958.

Latex

The liquid latex market has picked up a little, and there has been a fair turnover at the reduced price level. Off-take seems to be keeping pace with supply, but the July Malayan production of 9,820 tons, an increase of about 1,000 tons on June, and comparing with the production of 6,962 tons in July, 1956, and an average monthly production of 7,337 tons for the whole of that year, seems to suggest the possibility of a surplus developing if this rate is maintained over a long period. It is realized, of course, that consumption of liquid latex is growing every day, and its use is becoming more widespread throughout the world. On the other hand, the U.S.A. July consumption of natural latex is a little disappointing as only 5,146 tons were used—the lowest since July, 1956.

Prices for ASTM Centrifuged Concentrated natural latex, in tank-car quantities, f.o.b., rail tank cars, ranged during the period from 41.6-39.1¢ per pound solids. Synthetic latices were 23 to 30¢ for SBR; 39 to 55¢ for neoprene; and 48.5 to 65¢ a pound for nitrile types.

Final June and preliminary July domestic statistics for all latices were reported by the U. S. Department of Commerce as:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
June	0	4,809	5,445	10,931
July	0	....	5,146	12,105
SBR				
June	5,251	479	5,114	8,139
July	4,646	....	4,790	8,379
Neoprene				
June	819	0	736	1,377
July	572	0	604	1,251
Nitrile				
June	886	0	610	2,001
July	844	0	349	1,527

Scrap Rubber

It had been hoped that with the end of the slow summer months there might be an appreciable revival of activity in the scrap rubber market. Thus far, however, trade factors indicated that nothing has occurred which might indicate that mills were showing greater interest in acquiring either tires or tubes. There has been no push from Naugatuck, which continues to take limited quantities. Dealers say that

the market for tire-parts is just non-existent and that even tires are slow. Tubes are creeping along, and there has been no apparent demand for butyl tubes. Generally, that is the picture on the East Coast, although reports from Akron and the Midwest seem to indicate that the situation there is somewhat more active.

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$12.00	$12.00
S.A.G. truck tires	Nom.	Nom.
Peelings, No. 1	Nom.	Nom.
2	Nom.	Nom.
3	Nom.	Nom.
Tire buffings	Nom.	Nom.
	(¢ per Lb.)	
Auto tubes, mixed	2.75	2.75
Black	6.25	6.25
Red	6.50	7.00
Butyl	—	3.75

Reclaimed Rubber

Since August 15 the reclaim business has been much improved and is expected to continue at a better level for the remainder of the year. As anticipated, September has been a good month, and with the beginning of the presentation of the new models in the automotive industry, the reclaimed rubber industry business should also benefit.

According to The Rubber Manufacturers Association report, August production of reclaimed rubber reached 20,000 tons; while that month's consumption was 22,600 tons. During the eight-month period ending in August, domestic production totaled 182,821 tons; while total consumption amounted to 180,444 tons.

RECLAIMED RUBBER PRICES

Whole tire, first line	$0.11
Third line	.1025
Inner tube; black	.16
Red	.21
Butyl	.14
Light carcass	.22
Mechanical, light colored, medium gravity	.15
Black, medium gravity	.085

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Rayon

Total packaged production of rayon and acetate filament yarn during August was 51,700,000 pounds, consisting of 21,700,000 pounds of high-tenacity rayon yarn and 30,000,000 pounds of regular-tenacity rayon yarn. July production had been: total, 55,700,000; regular-tenacity yarn, 28,700,000; and high-tenacity rayon yarn, 27,000,000 pounds.

Filament yarn shipments to domestic consumers totaled 53,500,000 pounds, of which 22,500,000 pounds were high-tenacity rayon yarn and 31,000,000 pounds were regular-tenacity rayon yarn. July shipments had been: total, 54,100,000 pounds; high-tenacity, 25,900,000 pounds; regular-tenacity, 28,200,000 pounds.

Total end of August stocks were 67,200,000 pounds, made up of 12,200,000 pounds of high-tenacity rayon yarn and 55,000,000 pounds of regular-tenacity rayon yarn. End of July stocks had been: total, 69,900,000 pounds; high-tenacity yarn, 13,500,000 pounds; regular-tenacity, 56,400,000 pounds.

There have been no price changes of rayon and filament yarns recently.

RAYON PRICES

Tire Yarns	
High-Tenacity	
1100/ 490, 980	$0.59/$0.64
1100/ 490	.59/ .63
1150/ 490, 980	.59/ .63
1165/ 480	.59/ .65
1230/ 490	.59/ .63
1650/ 720	.55/ .58
1650/ 980	.55/ .58
1875/ 980	.55/ .58
2200/ 960	.54/ .57
2200/ 980	.54/ .57
2200/1466	.64
4400/2934	.60
Super-High Tenacity	
1650/ 720	.58
1900/ 720	.58
Tire Fabrics	
1100/490/2	.69 /.73
1650/980/2	.63 /.725
2200/980/2	.625/.655

Industrial Fabrics

Price shading is still prevalent in wide industrial fabrics as sharp competition for business continues in this market. A wide price differential as a result exists for heavy industrial goods for plastic coating uses, with some constructions varying as much as 3¢ or more a yard. Despite this continuing easy tone the pace of trading actually has picked up slightly in recent weeks. More goods are reported to have been released by coaters as auto manufacturers and rubber producers call in certain quantities of fabrics to meet specific needs.

INDUSTRIAL FABRICS

Drills		
59-inch 1.85 yd.	yd.	$0.340
2.25-yd.		.290
Ducks		
38-inch 1.78-yd. S.F.	yd.	nom.
2.00-yd. D.F.		.30
51.5-inch, 1.35-yd. S.F.	yd.	
Hose and belting		.69
Osnaburgs		
40-inch 2.11-yd.	yd.	.23
3.65-yd.		.1525
Raincoat Fabrics		
Printcloth, 38½-in., 64-60, 5.35-yd.	yd.	.1325
6.25-yd.		.1165
Sheeting, 48-inch, 4.17-yd.		.20
52-inch, 3.85-yd.		.2275
Chafer Fabrics		
14.40-oz./sq. yd. Pl.	yd.	.73
11.65-oz./sq. yd. S.		.61
10.80-oz./sq. yd. S.		.6575
8.9-oz./sq. yd. S.		.67
Other Fabrics		
Headlining, 59-in., 1.65-yd., 2-ply	yd.	.41
64-inch, 1.25-yd., 2-ply		.59
Sateens, 58-inch, 1.32-yd.		.525
58-inch, 1.21-yd.		.57

India

(Continued from page 119)

plan to produce synthetic rubber gets under way soon.

At the same time a new factor in rubber planting in India may have to be taken into account—that is, the possible transfer of European estates by a squeezing-out process in the State of Kerala.

Kerala is a newly formed state in South India which includes besides certain other territories the former states of Travancore and Cochin, with their plantations of tea, coffee, cardamom, and pepper, and, what is more important, practically all the rubber plantations in India as well. A Communist Ministry has come into power in Kerala which reportedly proposes to launch a program of special, increasingly heavy taxes on foreign-owned estates with the aim, presumably, of making profitable operation extremely difficult and thus forcing owners to sell out.

Netherlands

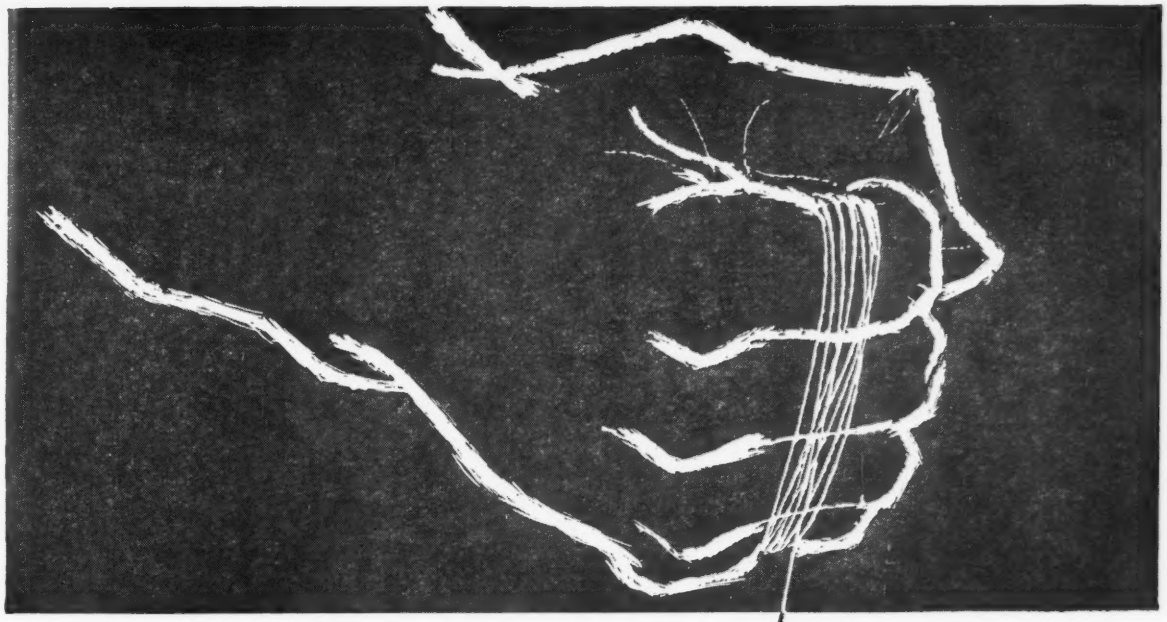
Nylon Cord Third Choice

Because of recent improvements, rayon yarn retains its predominant position for tires in Europe, and with steel wire coming up fast for heay-duty use, nylon is definitely a third choice for the tire producers, John Meynen, executive vice president of the well-known Netherlands manufacturer of man-made fibers, Algemene Kunstzijde Unie, N. V., is quoted as stating. The strength of rayon has been increased by 40%, and its fatigue resistance by 60% in the last three or four years, so that there is now only a negligible difference between rayon and nylon from a technical standpoint. Hence European producers see no reason to convert their plants to nylon which is not only more expensive than rayon, but apparently also gives tires with less resistance to tread wear; however, some nylon cord is produced for the premium-priced tire for larger cars.

At the same time the use of steel wire —still largely in the experimenal stage in the United States—is expanding in Europe for heavy-duty bus and truck tires and even for some passenger-car tires. Steel wire results in excellent tread wear and provides a hard surface that eliminates skidding and side slipping. It is also employed as a breaker strip in conjunction with a rayon cord carcass.

Communist China

Synthetic rubber is to be produced in Communist China by the Summer of 1958, according to a Peking newspaper. A plant for synthetic rubber and caustic soda is being erected at Changshou, on the upper Yangtse River, in Eastern Szechuan Province, the paper reportedly stated; the nearby Lungki River hydroelectric station would provide power.



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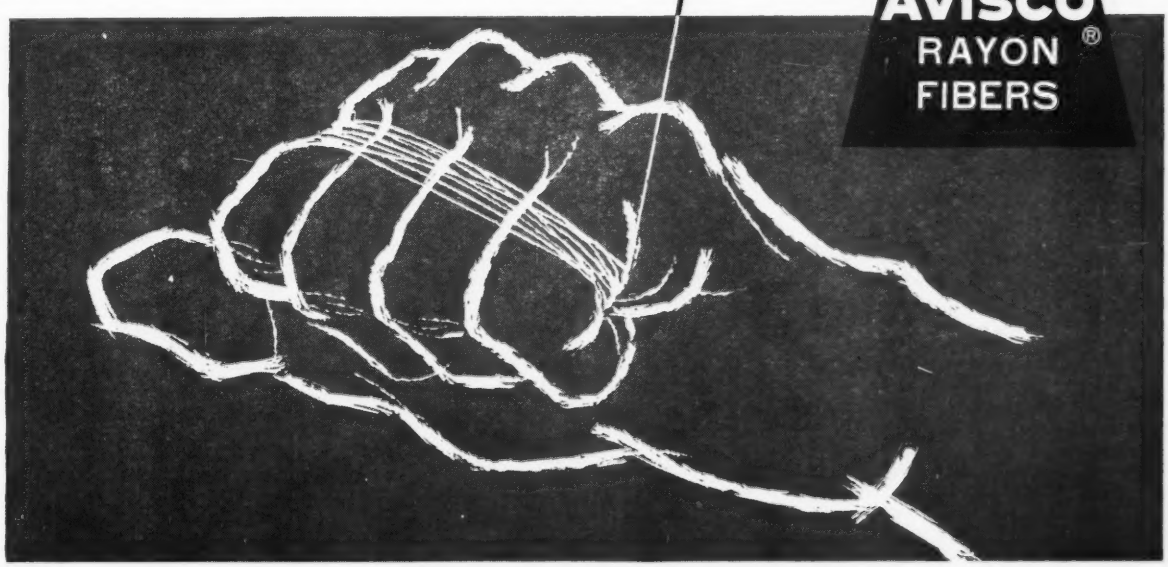

STATISTICS of the RUBBER INDUSTRY

U.S.A. Imports and Production of Natural (Including Latex and Guayule) and Synthetic Rubber (in Long Tons)

Year	Natural	GR-S	SBR-Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1950	802,249	350,801	28,086	60,915	50,067	12,037	1,304,155
1951	733,048	694,583	9,946	76,475	58,907	15,333	1,588,292
1952	805,575	636,969	17,885	81,630	65,745	16,228	1,624,454
1953	647,614	668,386	12,342	79,801	80,495	20,198	1,508,837
1954	597,200	472,698	17,707	58,802	69,150	21,396	1,236,601
1955	637,577	236,556	564,589	56,179	91,357	32,623	1,616,478
1956							
Jan.	58,803	....	76,028	6,896	8,207	3,125	153,059
Feb.	56,497	....	73,457	6,229	8,560	2,989	147,732
Mar.	52,749	....	77,812	5,686	7,822	3,663	147,732
Apr.	51,394	....	74,502	5,685	8,481	3,648	143,710
May	39,789	....	78,309	5,647	7,795	2,903	134,443
June	36,694	....	69,820	4,638	8,929	2,350	122,431
July	41,195	....	70,831	7,192	7,935	2,460	129,613
Aug.	40,367	....	70,122	7,118	7,769	2,141	127,517
Sept.	42,974	....	73,321	7,252	8,328	2,322	134,197
Oct.	52,638	....	70,690	7,018	8,144	2,973	141,463
Nov.	49,757	....	66,482	6,065	8,614	3,092	134,010
Dec.	57,653	....	76,056	6,496	8,828	2,921	151,954
Yr.-end adj.	+1,293	....	.....	....	....	.....	+1,293
Total	579,217	....	877,430	75,922	99,412	34,567	1,667,841
1957							
Jan.	46,349	....	76,224	6,366	9,432	2,893	141,264
Feb.	37,487	....	66,023	5,664	9,004	2,894	121,072
Mar.	40,680	....	76,546	6,460	8,031	3,291	135,008
Apr.	59,896	....	65,706	5,890	8,902	2,408	142,802
May	52,566	....	77,542	6,145	9,235	2,561	148,049
June		....	68,297	4,474	9,678	2,538	137,553
July*	30,290	....	67,796	1,972	8,591	2,592	111,241

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Consumption of Natural (Including Latex) and Synthetic Rubber (Long Tons)

Year	Natural	GR-S	SBR Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1950	720,268	388,427	27,803	66,348	43,781	11,930	1,258,557
1951	454,015	617,200	9,244	70,500	48,887	13,066	1,212,912
1952	453,846	648,816	17,604	71,229	55,522	13,866	1,260,883
1953	553,473	611,748	12,433	77,826	65,900	16,929	1,338,309
1954	596,285	483,001	17,344	61,464	57,203	17,715	1,233,412
1955	634,800	234,963	507,034	53,991	72,876	26,035	1,529,699
1956							
Jan.	53,751	....	65,375	4,223	6,684	2,198	132,231
Feb.	50,285	....	62,366	4,155	6,430	2,289	125,525
Mar.	50,040	....	64,458	4,515	6,542	2,373	127,928
Apr.	47,446	....	62,179	4,228	6,125	2,150	122,128
May	48,342	....	63,629	4,285	6,379	2,103	124,738
June	43,638	....	56,390	4,026	5,536	1,864	111,454
July	38,353	....	48,907	3,316	4,435	1,538	96,549
Aug.	46,700	....	59,756	4,102	6,554	2,125	119,237
Sept.	44,179	....	57,135	4,044	6,057	1,969	113,384
Oct.	52,188	....	67,399	4,780	7,478	2,366	134,211
Nov.	42,946	....	58,692	4,093	6,676	2,065	114,472
Dec.	45,220	....	60,742	3,814	5,956	1,893	117,625
Yr.-end adj.	−1,000	....	−3,000	....	....	+1,000	−3,000
Total	562,088	....	724,028	49,581	74,852	25,933	1,436,482
1957							
Jan.	52,631	....	70,978	5,028	7,237	2,247	138,121
Feb.	46,427	....	64,322	4,581	6,235	2,122	123,687
Mar.	48,263	....	67,853	4,998	6,559	2,240	129,913
Apr.	45,368	....	63,280	4,651	6,295	2,129	121,723
May	46,385	....	66,774	4,902	6,441	2,125	126,753
June	41,282	....	58,479	4,198	5,816	1,963	111,738
July*	39,683	....	59,117	4,192	5,125	1,543	109,660

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

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U.S.A. Stocks of Latex

(Long Tons, Dry Weight)

Year	Natural	GR-S*	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1956						
Jan.	16,059	6,522	1,093	1,906	9,521	25,580
Feb.	16,735	7,011	1,162	1,943	10,116	26,851
Mar.	18,309	6,867	1,097	2,340	10,304	28,613
Apr.	21,384	7,415	1,163	2,272	10,850	32,234
May	21,234	7,516	1,218	2,194	10,928	32,162
June	21,033	7,447	1,328	2,086	10,861	31,894
July	19,952	7,288	1,109	2,009	10,406	30,358
Aug.	18,099	6,402	1,076	1,703	9,181	27,280
Sept.	15,403	6,625	1,328	1,523	9,476	24,879
Oct.	12,322	5,703	1,263	1,680	8,646	20,968
Nov.	11,148	6,282	1,233	1,939	9,454	20,602
Dec.	12,262	7,327	1,421	2,017	10,765	23,027
Yr.-end adj.	....	....	....	+200	+200	+200
	12,262	7,327	1,421	2,217	10,965	23,227
1957						
Jan.	11,831	7,191	1,329	1,936	10,456	22,287
Feb.	9,940	7,415	1,169	2,051	10,635	20,575
Mar.	10,173	7,689	1,170	2,157	11,016	21,189
Apr.	12,064	8,096	1,183	1,836	11,115	23,179
May	11,733	7,885	1,407	1,710	11,002	22,735
June	10,931	8,139	1,377	2,001	11,517	22,448
July†	12,105	8,379	1,251	1,527	11,157	23,262

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.
*Includes SBR-Types. †Preliminary.

U.S.A. Exports of Synthetic Rubber

(Long Tons)

Year	SBR-Types	Butyl	Neoprene	N-Type	Total
1956					
Jan.	7,550	815	1,757	506	10,628
Feb.	9,018	1,624	1,521	449	12,612
Mar.	10,804	764	1,500	522	13,590
Apr.	10,271	374	1,917	587	13,149
May	10,864	743	2,142	443	14,192
June	9,558	746	2,088	548	12,940
July	9,038	523	1,994	433	11,988
Aug.	9,607	654	2,268	274	12,803
Sept.	8,804	439	2,824	403	12,470
Oct.	6,795	454	1,013	618	8,880
Nov.	4,789	247	1,056	551	6,643
Dec.	15,268	1,316	1,829	860	19,273
Total	112,366	8,699	21,909	6,194	149,168
1957					
Jan.	13,989	207	2,500	540	17,236
Feb.	13,353	439	2,505	482	16,779
Mar.	13,664	1,014	2,466	781	17,925
Apr.	10,625	372	2,244	620	13,861
May	12,208	603	2,480	517	15,808
June	13,886	762	2,315	492	17,455

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Stocks of Synthetic Rubber

(Long Tons)

Year	SBR-Types	Butyl	Neoprene	N-Type	Total
1956					
Jan.	111,263	12,303	11,850	6,316	141,732
Feb.	114,389	13,027	11,888	6,602	145,906
Mar.	118,063	13,458	12,037	7,437	150,995
Apr.	121,054	14,071	12,042	8,243	155,370
May	127,163	15,253	11,478	8,788	162,682
June	133,570	15,744	12,927	8,955	171,196
July	145,601	18,899	15,084	9,229	188,813
Aug.	148,176	21,267	14,540	8,503	192,486
Sept.	154,841	23,862	14,055	8,035	200,793
Oct.	151,646	25,734	12,841	7,567	197,788
Nov.	151,143	26,998	13,459	7,734	199,334
Dec.	151,934	28,685	14,043	7,934	202,596
Yr.-end adj.	.....	.....	.....	+250	+250
	151,934	28,685	14,043	8,184	202,846
1957					
Jan.	143,177	29,810	13,073	7,664	193,724
Feb.	134,587	29,951	12,705	7,565	184,808
Mar.	131,255	30,814	11,949	7,795	181,813
Apr.	122,764	31,536	12,064	7,247	173,611
May	121,638	31,812	13,010	6,981	173,441
June	120,694	31,569	13,822	7,085	173,170
July*	113,915	28,309	15,192	7,128	164,544

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.
*Preliminary.

U.S.A. Consumption of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	GR-S*	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1956						
Jan.	6,776	5,858	772	670	7,300	14,076
Feb.	6,399	5,913	787	730	7,430	13,829
Mar.	6,438	5,888	729	781	7,398	13,836
Apr.	5,693	4,923	741	692	6,356	12,049
May	5,239	4,745	778	691	6,214	11,453
June	5,171	4,350	637	657	5,644	10,815
July	4,855	3,731	562	466	4,759	9,614
Aug.	6,374	5,055	816	698	6,569	12,943
Sept.	6,233	4,937	692	699	6,328	12,561
Oct.	7,825	6,175	795	681	7,651	15,476
Nov.	6,431	5,406	723	659	6,788	13,219
Dec.	6,666	5,399	701	710	6,810	13,476
Yr.-end adj.	−1,000	+3,000	....	+800	+3,800	+2,800
Total	73,100	65,380	8,733	8,934	83,047	156,147
1957						
Jan.	6,994	6,288	856	841	7,985	14,979
Feb.	6,398	5,894	758	708	7,360	13,758
Mar.	7,081	6,370	784	799	7,953	15,034
Apr.	6,434	5,554	772	710	7,036	13,470
May	5,867	5,114	814	731	6,659	12,526
June	5,445	4,790	736	610	6,136	11,681
July†	5,146	5,273	604	349	6,226	11,372

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.
† Preliminary. *Includes SBR-Types.

U.S.A. Rubber Industry Sales and Inventories

(Million of Dollars)

	Value of Sales*				Manufacturers' Inventories*			
	1954	1955	1956	1957	1954	1955	1956	1957
Jan.	348	424	415	496	844	790	935	1,047
Feb.	351	440	445	495	857	782	970	1,036
Mar.	388	466	451	476	849	805	979	1,030
Apr.	375	445	445	490	812	784	970	1,031
May	357	465	464	481	810	810	985	1,024
June	377	465	450	...	829	850	975	...
July	374	471	459	...	784	853	987	...
Aug.	337	456	436	...	761	863	1,007	...
Sept.	334	456	429	...	804	874	1,007	...
Oct.	332	447	454	...	838	902	1,022	...
Nov.	388	482	463	...	819	935	1,024	...
Dec.	407	465	461	...	929	934	998	...
Total	4,368	5,493	5,372	...	Av. 831	845	988	...

Source: Office of Business Economics, U. S. Department of Commerce.
*Adjusted for seasonal variation.

U.S.A. Production of Cotton, Rayon, and Nylon Tire Fabrics

	Cotton and Nylon*		Rayon Tire Cord		Total All Tire Cord and Fabrics
1956	Cotton Chafer Fabrics and Other Tire Fabrics	Cotton and Nylon Tire Cord and Fabrics	Woven	Not Woven	
Jan.-Mar.	12,815	16,483	74,833	23,707	127,838
Apr.-June	10,330	18,354	61,196	21,557	112,554
July-Sept.	7,958	18,958	56,961	18,698	102,575
Oct.-Dec.	9,497	19,720	55,639	20,071	104,927
Total	40,590	73,515	248,629	84,033	447,884
1957					
Jan.-Mar.	11,028	20,676	69,610	21,872	124,297
Apr.-June	10,456	24,852	63,195	16,037	115,418

* Cotton and nylon figures combined to avoid disclosing data for individual companies.
Source: Bureau of the Census, United States Department of Commerce.

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U.S.A. Imports and Production of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	GR-S*	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1955	92,754	69,364	10,432	10,798	90,594	183,348
1956						
Jan.	10,328	6,885	848	919	8,652	18,980
Feb.	7,965	6,943	930	827	8,700	16,665
Mar.	7,800	5,911	782	1,158	7,851	15,651
Apr.	6,995	6,097	969	866	7,922	14,917
May	5,731	4,966	939	614	6,519	12,250
June	5,006	4,776	907	543	6,226	11,232
July	3,522	4,241	444	731	5,416	8,938
Aug.	4,715	4,902	882	684	6,468	11,183
Sept.	2,790	5,723	1,180	938	7,841	10,631
Oct.	5,738	6,122	908	1,183	8,213	13,951
Nov.	4,761	6,053	886	1,175	8,114	12,875
Dec.	6,661	7,143	967	1,012	9,122	15,783
Yr.-end adj.	—294	.....	.....	.....	.....	—294
Total	71,718	69,762	10,642	10,650	91,054	162,772
1957						
Jan.	6,460	7,228	905	960	9,093	15,553
Feb.	4,342	6,481	724	1,035	8,240	12,582
Mar.	5,856	7,227	924	1,127	9,278	15,134
Apr.	8,812	6,306	976	881	8,163	16,975
May	5,794	5,495	1,082	933	7,510	13,304
June	4,809	5,251	819	886	6,956	11,765
July†	.....	4,646	572	844	6,062	.....

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.
* Includes SBR-Types. † Preliminary.

U.S.A. New Supply, Consumption, Exports, and Stock of Reclaimed Rubber

(Long Tons)

Year	New Supply	Consumption	Exports	Stocks
1952	274,981	280,002	11,180	30,664
1953	298,336	285,050	11,397	32,319
1954	258,101	249,049	10,232	30,746
1955	326,649	312,781	13,988	31,498
1956				
Jan.	26,205	25,827	1,382	31,640
Feb.	27,108	25,571	1,115	31,875
Mar.	28,468	26,176	1,163	33,326
Apr.	26,933	23,999	1,179	34,360
May	25,485	23,560	1,297	34,863
June	22,153	20,560	1,264	35,647
July	19,776	18,099	952	35,703
Aug.	21,724	21,498	1,076	35,512
Sept.	22,368	20,242	1,015	36,527
Oct.	26,318	23,946	1,298	37,904
Nov.	20,009	20,832	1,189	36,063
Dec.	20,673	20,737	902	34,969
Year-end. adj.	.....	—500	....	.....
Total	287,220	270,547	13,832	34,969
1957				
Jan.	25,103	24,053	1,288	34,552
Feb.	21,896	22,773	1,263	32,010
Mar.	25,088	24,633	1,298	30,975
Apr.	22,878	23,145	1,201	30,258
May	24,884	23,816	1,277	29,847
June	22,402	21,352	....	30,378
July*	20,282	18,072	....	29,995

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.
* Preliminary.

Carbon Black Statistics — First Seven Months, 1957

Furnace blacks are classified as follows: SRF, Semi-reinforcing furnace black; HMF, high modulus furnace black; FEF, fast-extruding furnace black; HAF, high abrasion furnace black; SAF, super abrasion furnace black; ISAF, intermediate super abrasion furnace black.

(Thousands of Pounds)

	Jan.	Feb.	Mar.	Apr.	May	June	July
Production							
Furnace types							
Thermal	13,200	10,064	12,147	13,533	14,395	11,989	11,680
SRF	26,328	21,623	27,167	24,726	24,216	21,406	21,114
HMF	11,112	10,898	10,292	10,105	11,052	10,563	11,825
FEF	17,125	13,340	20,439	18,621	19,809	17,240	18,174
HAF	42,186	34,730	41,201	35,038	40,048	36,910	34,655
SAF, ISAF	16,348	15,246	18,864	15,213	15,512	16,488	18,747
Total furnace	126,299	105,901	130,110	117,236	125,032	114,596	116,195
Contact types	31,563	27,792	30,726	29,879	30,733	29,497	30,556
Totals	157,862	133,693	160,836	147,115	155,765	144,093	146,751
Shipments							
Furnace types							
Thermal	13,499	11,726	12,442	12,556	11,488	9,931	10,993
SRF	25,864	24,246	37,063	19,359	21,453	21,771	22,343
HMF	10,517	10,273	13,449	9,584	9,695	10,314	9,999
FEF	21,080	17,685	26,129	14,441	18,918	14,424	17,199
HAF	38,446	37,049	55,187	30,348	40,524	33,826	36,650
SAF, ISAF	15,978	14,692	20,562	15,622	15,505	14,225	15,882
Total furnace	125,384	115,671	164,832	101,910	117,583	104,491	113,066
Contact types	35,688	32,565	42,196	28,276	25,916	24,989	26,596
Totals	161,072	148,236	207,028	130,186	143,499	129,480	139,662
Producers' Stocks, End of Period							
Furnace types							
Thermal	18,478	16,816	16,521	17,498	20,405	22,463	23,150
SRF	76,472	73,781	63,885	69,252	72,015	71,650	70,421
HMF	20,163	20,788	17,631	18,152	19,509	19,758	21,584
FEF	29,362	25,006	19,316	23,496	24,387	27,203	28,178
HAF	60,018	57,699	43,713	48,403	47,927	51,011	49,016
SAF, ISAF	56,740	57,373	55,675	55,266	55,273	57,536	60,401
Total furnace	261,233	251,463	216,741	232,067	239,516	249,621	252,750
Contact types	73,385	68,612	57,142	58,745	63,562	68,070	72,030
Totals	334,618	320,075	273,883	290,812	303,078	317,691	324,780
Exports							
Furnace types							
Total furnace	18,605	23,722	23,357	30,550	26,581	19,359	—
Contact types	18,306	21,218	15,888	19,832	17,222	13,045	—
Totals	36,911	44,940	39,245	50,382	43,803	32,404	—

Source: Bureau of Mines, United States Department of the Interior, Washington, D. C.

SITUATIONS OPEN (Con't.)

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Excellent opportunity for experienced rubber chemists to take charge of compounding, development, and research groups with area interests on rubber heels, soles, open- and closed-cell sponge and mechanicals. This opportunity offers tremendous growth potential for the right men. Please send resumé to Box No. 2107, care of RUBBER WORLD.

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World Production of Synthetic Rubber

(1,000 Long Tons)

Year	U.S.A.	Canada	Germany	Total
1956				
Jan.	93.5	9.7	1.0	104.3
Feb.	90.5	8.2	1.0	99.7
Mar.	94.4	10.3	1.1	105.8
Apr.	91.6	10.3	1.0	102.8
May	93.7	10.6	1.0	105.3
June	85.3	10.4	0.6	96.3
July	88.0	8.7	1.0	97.7
Aug.	86.5	10.2	0.9	97.6
Sept.	90.6	10.7	0.8	102.1
Oct.	88.2	10.7	0.8	99.7
Nov.	83.5	10.3	0.8	94.7
Dec.	93.8	10.6	0.8	105.2
Total	1,079.6	120.7	10.7	1,211.0
1957				
Jan.	94.3	11.1	0.9	106.2
Feb.	83.2	9.8	1.1	94.1
Mar.	93.9	11.1	1.1	106.1
Apr.	82.3	11.0	...	...
May	95.0	11.5	...	...

Source: Secretariat of the International Rubber Study Group; and Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

World Consumption of Natural Rubber

(1,000 Long Tons)

Year	United States	Eastern Europe and China	United Kingdom	Other Foreign	Total Foreign	Grand* Total
1955	634.8	135.7	246.3	852.5	1,234.5	1,870.0
1956						
Jan.	53.7	19.1	21.7	68.8	109.6	162.5
Feb.	50.2	28.2	17.9	63.2	109.3	160.0
Mar.	50.0	23.1	16.0	71.4	110.5	160.0
Apr.	47.4	22.7	18.4	70.1	111.2	160.0
May	48.3	27.0	14.5	68.6	110.1	157.5
June	43.6	30.0	16.1	73.8	119.9	162.5
July	38.3	23.4	14.7	70.9	109.0	147.5
Aug.	46.6	13.9	10.3	64.9	89.1	135.0
Sept.	44.1	25.1	14.5	73.5	113.1	157.5
Oct.	52.1	17.5	18.8	78.3	114.6	167.5
Nov.	43.0	32.0	15.7	72.1	119.8	162.5
Dec.	45.1	34.0	14.3	66.5	114.8	160.0
Total	562.1	295.0	192.8	841.7	1,330.4	1,892.5
1957						
Jan.	52.6	13.0	14.4	74.9	102.3	155.0
Feb.	46.4	19.9	14.5	72.7	107.1	152.5
Mar.	48.3	23.6	17.6	72.7	113.9	162.5
Apr.	45.4	32.2	13.6	76.6	122.4	167.5
May	46.4	...	14.5	...	....	155.0

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; and Secretariat of the Interior Rubber Study Group.
* Estimated.

World Consumption of Synthetic Rubber*

(1,000 Long Tons)

Year	U.S.A.	Canada	United Kingdon	Total† Continent of Europe	World† Grand Total
1956					
Jan.	78.5	4.0	3.1	9.0	100.0
Feb.	75.2	4.1	3.1	9.0	95.0
Mar.	78.3	4.1	3.1	9.0	97.5
Apr.	73.7	4.4	3.6	8.8	97.5
May	76.4	4.5	3.2	8.5	97.5
June	67.8	4.0	3.6	9.5	90.0
July	58.2	3.7	2.9	8.8	80.0
Aug.	72.5	3.3	2.3	7.5	90.0
Sept.	69.2	3.9	3.2	9.0	90.0
Oct.	82.0	4.2	4.1	10.8	105.0
Nov.	71.5	4.3	3.9	10.5	95.0
Dec.	73.3	3.8	3.6	9.8	97.5
Total	877.3	48.4	39.5	110.5	1,135.0
1957					
Jan.	85.5	4.4	3.7	11.5	110.0
Feb.	77.9	4.2	3.9	11.3	102.5
Mar.	81.7	4.3	5.4	11.5	110.0
Apr.	76.4	4.2	4.0	...	102.5
May	79.9	4.7	4.8	...	105.0

Source: Secretariat of the International Rubber Study Group; Bureau of the Census, Industry Division, Chemical Branch, United States Department of Commerce.
* Includes latices.
† Figures estimated or partly estimated.

World Production of Natural Rubber

(1,000 Long Tons)

	Malaya		Indonesia			
Year	Estate	Native	Estate	Native	All Other	Total
1955	352.9	286.2	261.3	471.0	540.3	1,912.5
1956						
Jan.	32.6	26.5	23.7	17.7	49.5	150.0
Feb.	27.6	24.3	23.0	21.0	41.6	137.5
Mar.	28.5	22.5	21.5	16.9	43.0	132.5
Apr.	26.7	21.7	20.0	46.1	40.4	155.0
May	23.5	19.8	18.0	38.4	42.9	142.5
June	29.5	23.2	21.9	25.7	47.0	147.5
July	30.8	23.9	21.3	41.3	47.6	165.0
Aug.	30.3	23.0	20.3	64.0	49.9	187.5
Sept.	30.2	21.9	21.3	28.8	42.7	145.0
Oct.	30.5	22.5	22.0	34.0	58.5	167.5
Nov.	28.4	21.3	21.9	44.0	54.1	170.0
Dec.	34.7	24.2	23.0	49.2	56.1	187.5
Total	353.0	274.4	259.0	427.8	532.9	1,887.5
1957						
Jan.	36.1	27.3	23.8	22.7	45.1	155.0
Feb.	27.1	22.1	20.6	16.4	38.8	125.0
Mar.	26.0	21.1	19.7	46.1	52.2	165.0
Apr.	26.6	22.5	19.6	41.6	39.8	150.0
May	27.2	18.3	18.1	30.4	43.5	137.5

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; Secretariat of the International Rubber Study Group.

U.S.A. Synthetic Rubber Industry, Wages, Hours

Year	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings
1956			
Jan.	$101.88	42.1	$2.42
Feb.	101.57	41.8	2.43
Mar.	102.51	41.5	2.47
Apr.	102.75	41.6	2.47
May	103.00	41.2	2.50
June	103.41	41.2	2.51
July	103.75	41.5	2.50
Aug.	108.03	42.2	2.56
Sept.	104.90	41.3	2.54
Oct.	107.52	42.0	2.56
Nov.	103.57	41.1	2.52
Dec.	107.33	41.6	2.58
1957			
Jan.	106.30	41.2	2.58
Feb.	104.19	40.7	2.56
Mar.	104.86	40.8	2.57
Apr.	103.94	40.6	2.56
May	105.93	40.9	2.59

Source: BLS, United States Department of Labor.

U.S.A. Automotive Inner Tubes

(Thousands of Units)

	Shipments					
Year	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1956						
Jan.	274	3,263	72	3,608	2,918	6,294
Feb.	273	2,548	100	2,921	2,969	6,547
Mar.	282	2,587	93	2,962	3,347	6,848
Apr.	265	2,444	88	2,797	3,094	7,312
May	280	2,515	83	2,878	3,093	7,657
June	269	3,023	79	3,370	2,837	7,349
July	248	3,055	82	3,384	2,300	6,418
Aug.	242	2,954	99	3,295	2,795	5,962
Sept.	213	2,472	91	2,777	2,774	6,056
Oct.	261	2,514	102	2,877	3,025	6,469
Nov.	259	2,468	65	2,792	2,585	6,250
Dec.	235	2,515	87	2,838	2,670	6,109
Total	3,101	32,358	1,041	36,499	34,407	
1957						
Jan.	274	3,263	72	3,608	2,918	6,294
Feb.	267	2,964	61	3,292	3,362	5,960
Mar.	240	3,057	100	3,397	3,822	6,540
Apr.	311	2,708	85	3,104	3,428	6,969
May	301	2,827	86	3,214	3,548	7,422
June	275	3,141	69	3,485	3,025	6,946
July	258	3,364	86	3,708	2,941	6,287

Source: The Rubber Manufacturers Association, Inc.

MACHINERY & SUPPLIES FOR SALE (Con't.)

FOR SALE: ALL IN STOCK! 6—465-GAL. STAINLESS-STEEL Reactors, 150# C.W.P., 165# jkt. 3—4' x 84" vert. vulcanizers, quick-opening doors, ASME 120#. 1—Farrel 3400 HP Horiz. reducer. 1—6" x 13" new cab. mill. 2—50" mills. 2—40 HP Sprout-Waldron rotary-knife cutters. 1—6 oz. Watson-Stillman & 1—6 oz. Lester injection molding machine. Sigma blade mixers—2½, 5, 10, 35, 50, 60, 75, 100, 150 gal.—stainless steel & steel. Tablet or preform press—Stokes "R," "T," "DD-2," "RD-4," Kux rotary 21, 25 punch. SEND FOR COMPLETE INVENTORY BULLETIN! PERRY EQUIPMENT CORP., 1424 N. 6th St., Phila. 22, Pa.

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"ARMACO"

U.S.A. Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
Passenger Car						
1953	33,106	45,798	809	79,713	81,455	13,044
1954	29,746	47,043	928	77,717	76,806	12,228
1955	42,574	50,156	966	93,698	97,232	15,963
1956						
Jan.	2,958	4,040	66	7,064	7,661	16,546
Feb.	2,919	3,387	90	6,396	7,571	17,701
Mar.	3,027	4,372	65	7,464	7,812	18,096
Apr.	2,787	4,994	67	7,847	7,530	17,649
May	2,349	5,203	65	7,617	7,628	17,714
June	2,162	5,659	64	7,885	6,600	16,443
July	2,471	5,482	73	8,026	5,669	14,088
Aug.	1,953	5,359	77	7,389	6,897	13,578
Sept.	1,262	4,427	70	5,758	6,647	14,468
Oct.	2,530	3,854	87	6,471	7,526	15,607
Nov.	3,179	3,255	62	6,496	6,580	15,596
Dec.	3,277	3,220	90	6,587	7,425	16,494
Total	30,874	42,411	876	85,000	95,546	
1957						
Jan.	3,192	4,521	100	7,812	8,296	16,978
Feb.	3,017	4,453	68	7,538	8,047	17,376
Mar.	3,051	4,875	80	8,006	8,629	18,065
Apr.	2,809	5,218	78	8,104	7,878	17,821
May	2,831	5,166	60	8,057	8,313	18,050
June	2,623	5,532	63	8,217	7,462	17,322
July	2,719	5,826	65	8,611	7,449	16,097
Truck and Bus						
1953	4,843	9,326	734	14,904	14,696	2,676
1954	3,592	8,111	826	12,529	12,347	2,546
1955	4,801	9,034	910	14,746	14,957	2,815
1956						
Jan.	444	629	65	1,139	1,318	2,971
Feb.	424	565	88	1,077	1,326	3,232
Mar.	439	662	62	1,163	1,382	3,465
Apr.	430	767	74	1,271	1,303	3,483
May	421	777	65	1,264	1,358	3,582
June	372	968	65	1,404	1,329	3,504
July	362	837	73	1,272	1,073	3,306
Aug.	349	820	86	1,254	1,154	3,217
Sept.	291	811	92	1,194	1,153	3,180
Oct.	378	849	78	1,305	1,273	3,168
Nov.	337	626	59	1,022	1,060	3,207
Dec.	301	583	76	961	1,130	3,378
Total	4,548	8,894	883	14,326	14,589	
1957						
Jan.	305	678	83	1,066	1,208	3,512
Feb.	344	598	59	1,001	1,122	3,633
Mar.	330	704	74	1,107	1,136	3,678
Apr.	438	771	49	1,277	1,072	3,486
May	399	620	74	1,094	1,178	3,580
June	370	715	64	1,149	1,027	3,461
July	349	819	61	1,229	994	3,219
Total Automotive						
1953	37,949	55,124	1,543	94,617	96,150	15,720
1954	33,338	55,154	1,754	90,246	89,153	14,774
1955	47,375	59,191	1,878	108,447	112,178	18,778
1956						
Jan.	3,402	4,669	131	8,203	8,979	19,517
Feb.	3,343	3,953	178	7,473	8,897	20,934
Mar.	3,466	5,034	127	8,627	9,193	21,562
Apr.	3,217	5,761	141	9,119	8,834	21,132
May	2,770	5,980	130	8,880	8,987	21,296
June	2,533	6,627	129	9,289	7,930	19,947
July	2,833	6,319	146	9,298	6,741	17,394
Aug.	2,303	6,179	163	8,644	8,050	16,795
Sept.	1,553	5,238	162	6,952	7,800	17,648
Oct.	2,908	4,703	165	7,776	8,799	18,775
Nov.	3,516	3,881	121	7,518	7,641	18,803
Dec.	3,579	3,803	166	7,548	8,556	19,872
Total	35,423	62,147	1,759	99,327	100,407	
1957						
Jan.	3,496	5,199	183	8,878	9,504	20,490
Feb.	3,361	5,052	127	8,539	9,169	21,009
Mar.	3,381	5,579	154	9,114	9,766	21,743
Apr.	3,246	5,989	146	9,381	8,950	21,308
May	3,230	5,787	134	9,150	9,490	21,630
June	2,993	6,247	127	9,366	8,489	20,783
July	3,068	6,646	126	9,840	8,443	19,316

Source: The Rubber Manufacturers Association, Inc.

U.S.A. Rubber Industry Employment, Wages, Hours

Year	Production Workers (1000's)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Consumer's Price Index
		All Rubber Products			
1939	121	$27.84	39.9	$0.75	
1954	195	78.21	39.7	1.97	114.8
1955	214.7	87.15	41.7	2.09	114.5
1956					
Apr.	224.6	85.79	39.9	2.15	114.9
May	215.9	85.79	39.9	2.15	115.4
June	203.4	84.74	39.6	2.14	116.2
July	202.8	85.75	39.7	2.16	117.0
Aug.	205.5	87.23	40.2	2.17	116.8
Sept.	209.9	89.10	40.5	2.20	117.1
Oct.	214.5	89.98	40.9	2.20	117.7
Nov.	194.4	87.89	40.5	2.17	117.8
Dec.	215.8	92.74	41.4	2.24	118.0
1957					
Jan.	216.0	91.21	40.9	2.23	118.2
Feb.	212.6	90.80	40.9	2.22	118.7
Mar.	211.4	89.28	40.4	2.21	118.9
Apr.	191.3	87.60	40.0	2.19	119.3
May	204.6	89.02	40.1	2.22	119.6
June	200.7	...	...	...	120.2
		Tires and Tubes			
1939	54.2	$33.36	35.0	$0.96	
1954	79.7	87.85	38.7	2.27	
1955	88.6	101.09	41.6	2.43	
1956					
Apr.	91.8	98.00	39.2	2.50	
May	91.6	99.65	39.7	2.51	
June	84.9	98.25	39.3	2.50	
July	84.7	98.14	39.1	2.51	
Aug.	84.4	101.20	40.0	2.53	
Sept.	86.0	102.51	40.2	2.55	
Oct.	86.0	102.66	40.1	2.56	
Nov.	70.1	103.53	40.6	2.55	
Dec.	87.3	109.25	41.7	2.62	
1957					
Jan.	87.4	107.64	41.4	2.60	
Feb.	86.8	106.19	41.0	2.59	
Mar.	86.9	102.40	40.0	2.56	
Apr.	71.1	103.46	40.1	2.58	
May	85.1	103.83	40.4	2.57	
		Rubber Footwear			
1939	14.8	$22.80	37.5	$0.61	
1954	20.7	67.43	39.9	1.69	
1955	18.2	70.70	40.4	1.75	
1956					
Apr.	20.3	72.25	39.7	1.82	
May	20.0	72.25	39.7	1.82	
June	19.5	70.53	39.4	1.79	
July	19.0	71.28	39.6	1.80	
Aug.	19.3	70.35	39.3	1.79	
Sept.	19.4	71.71	39.4	1.82	
Oct.	19.3	71.71	39.4	1.82	
Nov.	18.9	71.55	39.1	1.83	
Dec.	18.6	73.26	39.6	1.85	
1957					
Jan.	18.3	71.76	39.0	1.84	
Feb.	17.8	72.10	39.4	1.83	
Mar.	17.8	72.86	39.5	1.84	
Apr.	17.5	70.64	38.6	1.83	
May	17.3	71.92	39.3	1.83	
		Other Rubber Products			
1939	51.9	$23.34	38.9	$0.61	
1954	94.3	71.91	40.4	1.78	
1955	107.9	78.35	41.9	1.87	
1956					
Apr.	106.6	77.95	40.6	1.92	
May	104.7	76.99	40.0	1.92	
June	99.0	76.02	39.8	1.91	
July	99.1	77.78	40.3	1.93	
Aug.	101.8	78.76	40.6	1.94	
Sept.	104.5	81.18	41.0	1.98	
Oct.	109.2	82.98	41.7	1.99	
Nov.	105.4	79.98	40.6	1.97	
Dec.	109.9	82.59	41.5	1.99	
1957					
Jan.	110.3	81.39	40.9	1.99	
Feb.	108.0	81.18	41.0	1.98	
Mar.	106.7	81.19	40.8	1.99	
Apr.	102.7	79.60	40.2	1.98	
May	102.2	79.60	40.0	1.99	

Source: BLS, United States Department of Labor.

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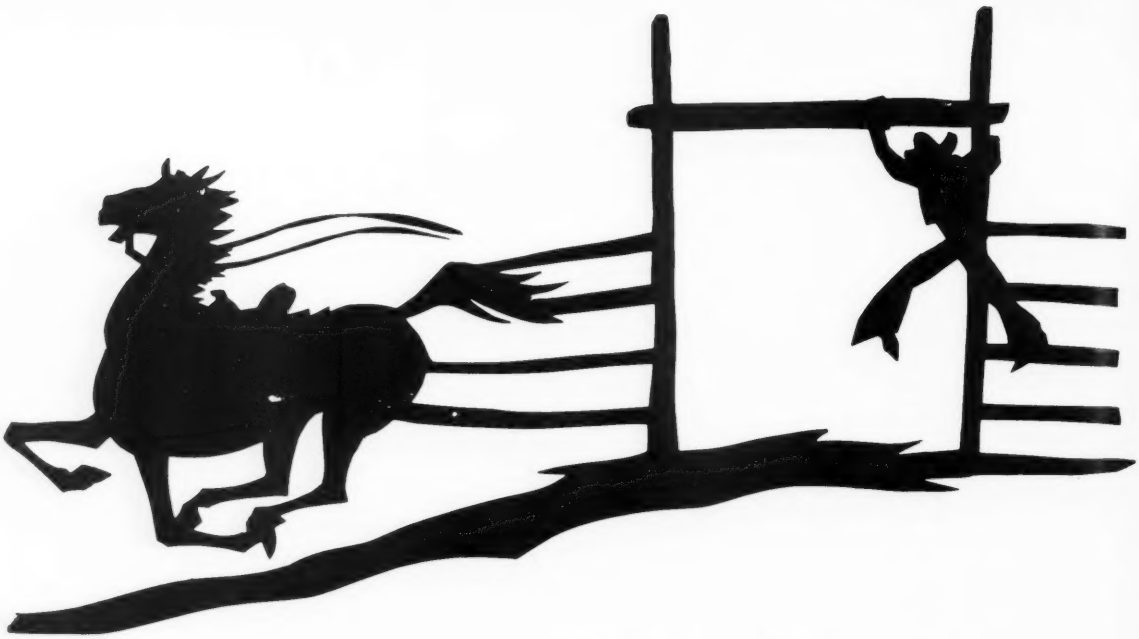

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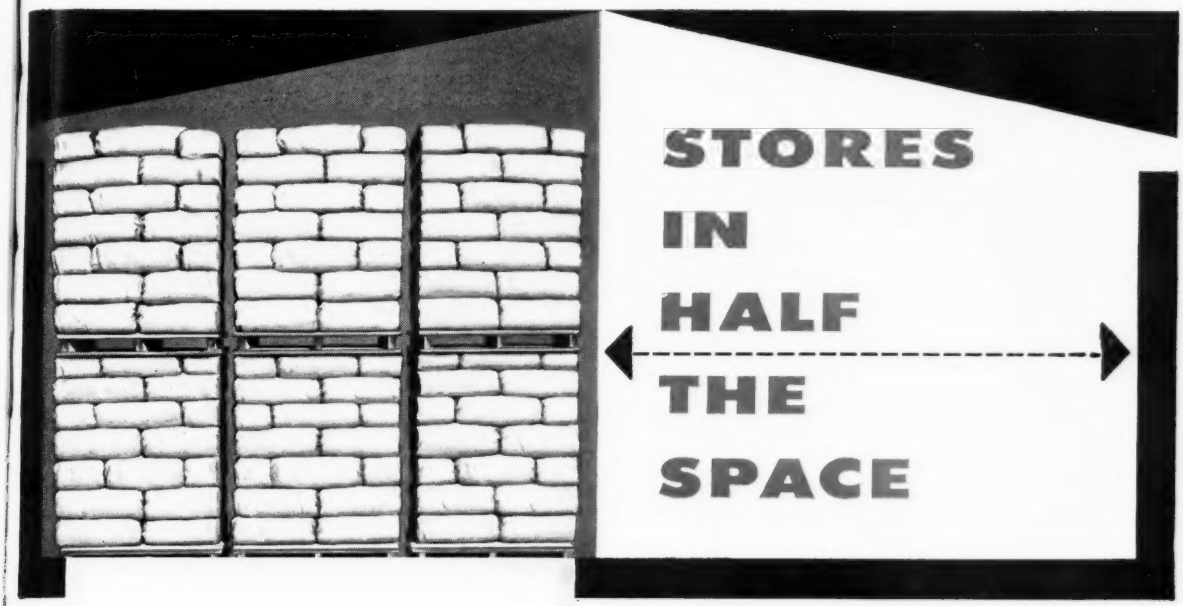

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